Features in subjects with the frontal occlusal plane inclined toward the contralateral side of the mandibular deviation

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Introduction: The frontal occlusal plane of the maxilla generally inclines toward the ipsilateral side of the mandibular deviation in subjects with facial asymmetry; however, a few patients with facial asymmetry have their frontal occlusal planes inclined toward the contralateral side. We aimed to investigate the morphologic and functional features of such patients. **Methods:** The subjects were 40 patients with facial asymmetry divided into 2 groups based on the inclination of the frontal occlusal plane toward the ipsilateral or the contralateral side. We analyzed lateral and posteroanterior cephalometric radiographs and occlusal variables and evaluated temporomandibular joint symptoms. Statistical comparisons were performed between the 2 groups ($P < 0.05$). **Results:** The posteroanterior cephalometry significantly differed between the ipsilateral and contralateral groups. Occlusal force and occlusal contact area were significantly larger, and temporomandibular joint symptoms were more frequently found on the side of the upward-inclined frontal occlusal plane than on the opposite side in both groups. **Conclusions:** The features in the contralateral group in terms of occlusal force and temporomandibular disorders were clinically significant. Clinicians should note that the conditions associated with the contralateral group require less presurgical decompensation. (Am J Orthod Dentofacial Orthop 2016;149:46-54)

Orthognathic surgery is an effective method to achieve good occlusion and improve skeletal morphology and facial appearance in subjects with facial deformity and disharmony between the maxilla and the mandible.

Esthetic demands include improvements in the horizontal and vertical dimensions of the maxilla and the mandible that alter the facial profile and the frontal aspect for facial asymmetry (FA); this is an important treatment goal for orthognathic surgery.[1-7] However, it is difficult to estimate FA accurately before treatment because it requires bilateral evaluations by both the patient and the operator. Many morphologic studies have evaluated skeletal and soft tissue characteristics in the lateral and frontal aspects using cephalometry for diagnosis and treatment planning.[8-23] Three-dimensional computed tomography is commonly used for diagnosis.[8,9,13,14]

Many studies have shown that subjects with FA have morphologic problems and functional disorders in the oral and facial areas, such as occlusal force and temporomandibular disorders (TMDs).[12,20,21,24-30] Occlusal force is lower in subjects with FA than in normal subjects.[24] Moreover, the occlusal force and the occlusal contact areas of the ipsilateral side to the mandibular deviation are significantly greater than those of the contralateral side in patients with FA.[26] Furthermore, the prevalence of TMDs is higher in patients with FA[24] and is more frequent in the ipsilateral side.[29] Therefore, we assumed that functional aspects such as occlusal force and TMDs are related to 3-dimensional morphologic disharmonies of the maxilla and the mandible in the sagittal and frontal planes.

Most clinical studies of FA have focused on the mandibular deviation, and some have described a relationship between mandibular lateral deviation and the

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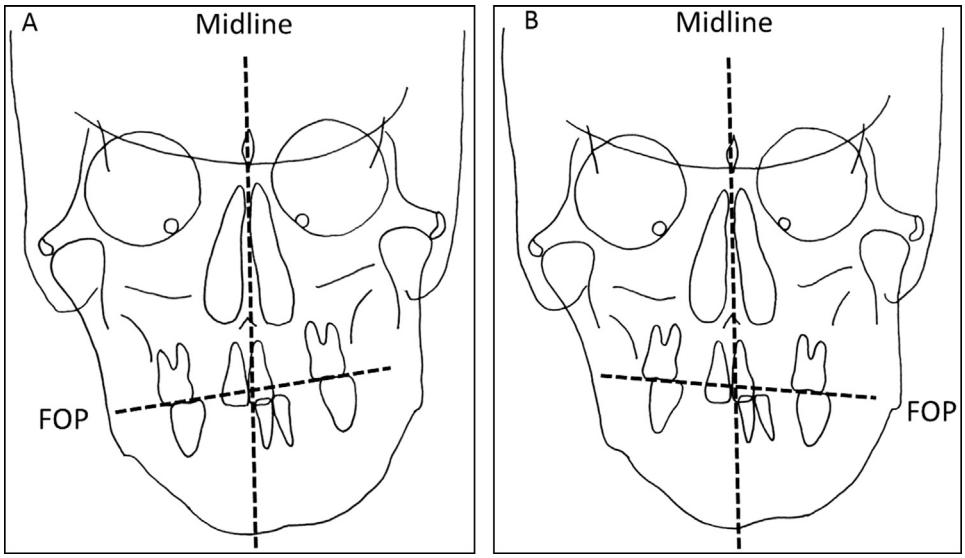

Fig 1. Illustrations of subjects in **A,** the ipsilateral group, with the frontal occlusal plane inclined toward the ipsilateral side of the mandibular deviation; and **B,** the contralateral group, with the frontal occlusal plane inclined toward the contralateral side of the mandibular deviation. Midline, CG-ANS; FOP, the line joining the bilateral maxillary first molars.

inclination of the frontal occlusal plane (FOP) of the maxilla.[20,21] There is a strong correlation between mandibular lateral deviation and canting of the maxillary FOP, which tends to incline toward the ipsilateral side of the mandibular deviation[20,21]; however, we have previously reported on patients with FA whose FOPs inclined toward the contralateral side.[31]

The aim of this study was to investigate the morphologic and functional features of subjects with the FOP inclined toward the contralateral side of the mandibular deviation. We tested the null hypothesis that there would be no significant difference in morphologic and functional features between the patients with the FOP inclined toward the ipsilateral and contralateral sides of the mandibular deviation except for the dentoalveolar measurements.

MATERIAL AND METHODS

We examined patient records from April 2006 to December 2012 at the orthodontic department of Tokyo Medical and Dental University; 272 (67.2%) of 405 patients with mandibular protrusion (ANB angle $\leq 0.0^{\circ}$) were found to have prominent FA, defined as a deviation of 2.0 mm or more of menton to the cranial midline on a posteroanterior (PA) cephalometric radiograph. We found that 206 of the 272 patients (75.7%) had the FOP inclined toward the ipsilateral side of the mandibular deviation. Only 20 of the 272 patients (7.4%) had the FOP inclined toward the contralateral side. No inclination of the FOP was seen in the remaining 46 patients (16.9%), since they did not meet our definition of FOP with an absolute value of 1.0° or more. Positive and negative values indicate that the FOP is inclined toward either the ipsilateral or the contralateral side of the mandibular deviation, respectively.

We randomly selected 20 patients (11 men, 9 women), aged 24.7 ± 4.2 years (mean ± SD), from the 206 patients in whom the FOP was inclined toward the ipsilateral side of the mandibular deviation (Fig 1, *A*). This was called the ipsilateral group. Another 20 patients (11 men, 9 women), aged 25.5 ± 3.8 years, whose FOPs inclined toward the contralateral side of the mandibular deviation (Fig 1, *B*), were referred to as the contralateral group.

The subjects met the following criteria: (1) no previous orthodontic treatment, (2) no clinical history of lateral functional mandibular shifts on closure, and (3) no congenital anomaly. We (1) performed lateral cephalometry, (2) performed PA cephalometry, (3) measured the occlusal force and occlusal area, and (4) evaluated TMDs.

We performed lateral cephalometry with the landmarks and measurements (Fig 2) to delineate the skeletal features of both groups in the sagittal dimensions. Likewise, we performed PA cephalometry with the landmarks and measurements (Fig 3) described previously to investigate the skeletal features in the frontal dimension.[9-11]