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Clinical observation

Jaw asymmetry may cause bad posture of the head and the spine—A preliminary study

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ABSTRACT

Objective: Dental occlusion may relate to general conditions including posture, however, there is little evidence of jaw deformities and general posture. The objective of this study is to assess the relationship between skeletal jaw asymmetry and head/body posture.

Methods: Forty-five mandibular asymmetry patients were included in this study. Lateral mandibular deviation, head inclination, and vertebrae deviation were studied before and after orthognathic surgery.

Results: There was a correlation between mandibular deviation and head inclination, however, there were no correlation between vertebrae deviation and head inclination. On average, head inclination and vertebrae deviation were not changed after orthognathic surgery. But, for cases with a large deviation, they improved after surgery.

Conclusions: Lateral mandibular deviation influences head and spine posture, in most cases reversibly.

1. Introduction

Dental occlusion may relate to general conditions including posture [1], however, there is little evidence of jaw deformities and general posture. Some studies have suggested that there is a relationship between lateral displacement of the mandible and scoliosis [2,3]. In addition to scoliosis, some patients with jaw deformity shows inclination of the head clinically.

In this study, the relationship between lateral displacement of the mandible and inclination of the head and vertebrae was analyzed including post-orthognathic surgical change.

2. Methods

2.1. Patients

Forty-five non-syndromic Japanese patients (10 male, 35 female), who were diagnosed with jaw deformities and who underwent surgical orthognathic treatment at Kyushu University Hospital from April 2011 to August 2014 were enrolled in this study. Their mean age at the time of radiography was 26.3 ± 8.7 years. The skeletal classification was 10 skeletal I, 5 skeletal II, and 30 skeletal III, respectively. Thirty patients were operated with two jaw surgery (LF1 + BSSRO) and fifteen patients were with one-jaw surgery (BSSRO). Post-surgical evaluation was performed almost 1 year (mean; 11.3 ± 5.4months) after orthognathic surgery, just before removal of the osteosynthesis devices (plates and screws). All patients showed acceptable occlusion and symmetry after surgery. All measurements were performed by two investigators. The study was approved by the Ethics Committee of Kyushu University Hospital, and all participants signed informed consent forms.

2.2. Evaluation

2.2.1. Lateral deviation of the mandible

Lateral deviations of the mandible were measured by posterior-anterior (PA) cephalometric radiographs according to Nakashima et al. [3]. (Fig. 1), where the horizontal axis was aligned with both zygomatic bone, and the midline was based on the anterior nasal spine (ANS).The deviation was measured by the angle between the vertical axis and menton (Me). In this study, menton deviated to the left side has a positive value.

2.2.2. Lateral deviation of the vertebrae

Lateral deviation of the vertebrae was analyzed by Cobb's angle on a posterior-anterior (PA) chest X-ray image. The Cobb's angle was defined as the angle between a line perpendicular to the most caudal vertebra

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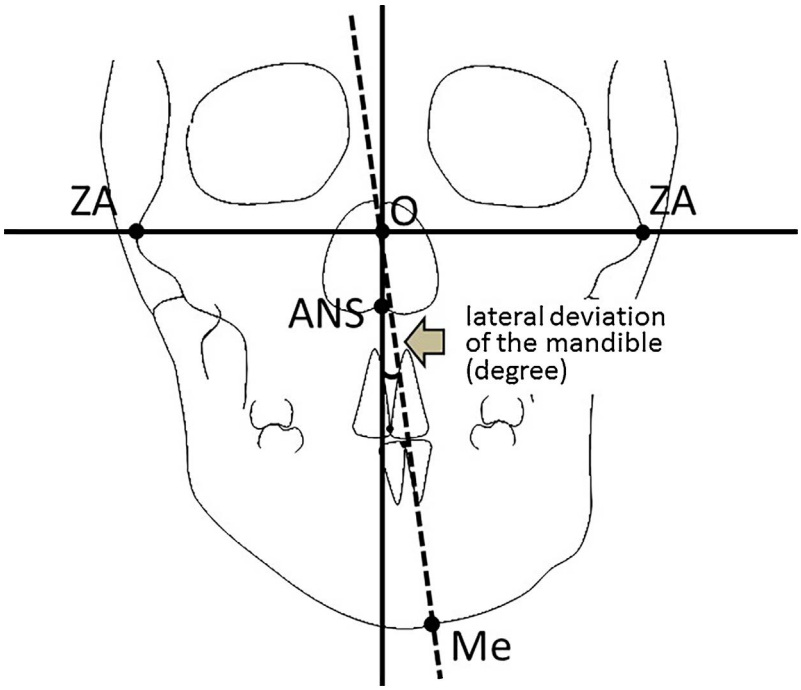

Fig. 1. Definition of lateral deviation of the mandible.
The horizontal axis was aligned with both zygomatic bones, and the midline was based on the anterior nasal spine (ANS).The deviation was measured by the angle between the vertical axis and menton (Me).
In this study, menton deviated to the left side has a positive value.

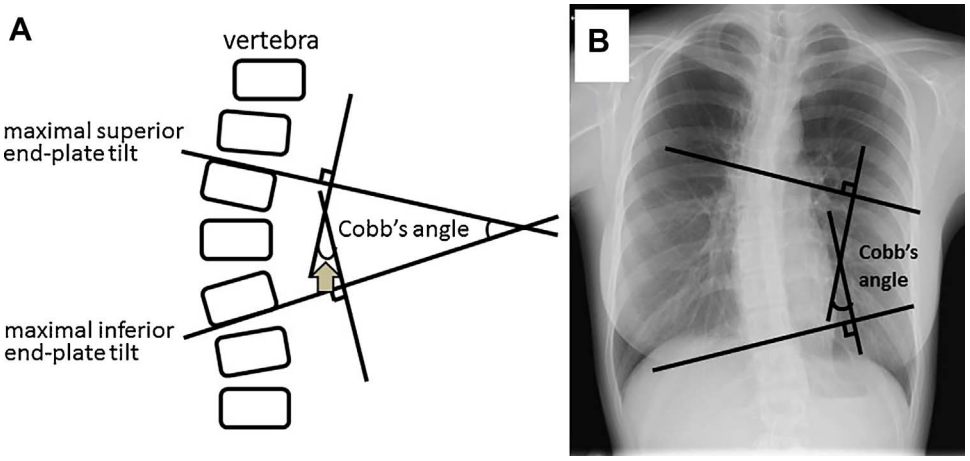

Fig. 2. Definition of lateral deviation of the vertebrae (Cobb's angle).
Cobb's angle was defined as the angle between a line perpendicular to the most caudal vertebra with a maximal inferior end-plate tilt and a line perpendicular to the most cephalad vertebra with a maximal superior end-plate tilt.
In this study, the vertebrae which bend to the right side have a positive value. The chest radiograph (B) has a negative value.

with a maximal inferior end-plate tilt and a line perpendicular to the most cephalad vertebra with a maximal superior end-plate tilt (Fig. 2).

In this study, the vertebra which bend to the right side have a positive value. The findings of the chest radiograph in Fig. 2B have a negative value.

2.2.3. Lateral inclination of the head

Lateral inclination of the head was measured by frontal photographs of the face taken without ear-rod in a relaxed posture (Fig. 3). The deviation was measured by the angle between the horizontal line (HL) and the inter-pupillary line (IPL). HL was defined as a parallel line to the floor guided by backboard.

2.3. Statistical analysis

All measurements were performed by two investigators. Correlations between the variables were analyzed by Spearman's rho correlation coefficient (r). The differences between the mean values were compared using paired *t*-tests. All statistical analyses were performed using a statistical package (IBM SPSS, ver. 19), and p values of < 0.05 were considered to be statistically significant.

3. Results

3.1. Relationship between mandibular deviation and head inclination

There was a negative correlation between mandibular deviation and head inclination in the frontal plane ($p < 0.01$, $r = 0.4147$; Fig. 4).

That is to say, a patient with leftward mandibular deviation tended to incline the head in a cranially right and caudally left (counterclockwise) direction.

However, there was no correlation between them in absolute values.

3.2. Relationship between vertebrae deviation and head inclination

There was no correlation between vertebrae deviation and head inclination ($p > 0.1$, $r = 0.22$).