

# Unintentional temporomandibular joint disc reduction after orthognathic surgery: A case report with long-term imaging follow-up

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## ABSTRACT

This report presents a rare case where a displaced temporomandibular joint (TMJ) disc was reduced to its normal position after orthognathic surgery, and long-term magnetic resonance imaging (MRI) follow-up visualized these postoperative changes. A 22-year-old male patient presented for facial asymmetry. He also complained of pain in the right TMJ area, and MRI showed disc displacements in both TMJs. After orthognathic surgery for facial asymmetry correction, the TMJ was re-evaluated. The symptom had resolved and the disc was positioned within the normal range during mouth opening. However, 6 and a half years after surgery, he complained of recurrent pain in the right joint, and MRI revealed medial disc displacement in the right TMJ. In conclusion, the influence of orthognathic surgery on the disc position might continue for a long time until the TMJ adapts to the new position. Careful and long-term follow-up is suggested to assess the TMJ complex. (*Imaging Sci Dent* 2022; 52: 409-13)

**KEY WORDS:** Temporomandibular Joint Disc; Orthognathic Surgery; Temporomandibular Joint Disorders; Magnetic Resonance Imaging

The influence of orthognathic surgery on temporomandibular disorder (TMD) has been studied by many researchers, but no consensus has been reached.<sup>1-9</sup> Most studies have reported that the disc position of the temporomandibular joint (TMJ) showed no significant changes after orthognathic surgery. However, the majority of the patients in those studies did not have TMD before surgery, whereas few studies have focused on patients with underlying TMD preoperatively.<sup>1,3,5,7-9</sup> Thus, patients with underlying TMD should be carefully evaluated both before and after orthognathic surgery, with long-term follow-up.

In light of the potential influence of orthognathic surgery on the TMJ, researchers have evaluated morphometric changes of the condyle after orthognathic surgery. However, condylar changes after orthognathic surgery were not significant, with no apparent changes in the distances or angles

between each condyle,<sup>2</sup> or only a small proportion (5.8%) of patients showing condyle resorption.<sup>4</sup> Since bony changes of the condyle occur in later stages of TMD,<sup>10</sup> analyses of the influence of surgery on the TMJ should focus more on incipient reactions of the joint, such as TMJ disc displacement.

One of the initial pathologic findings of TMD is disc displacement, which is observed before apparent osseous changes.<sup>10</sup> Disc displacement can be directly assessed only through magnetic resonance imaging (MRI).<sup>11</sup> However, it is impractical to perform MRI routinely before and after orthognathic surgery, and studies have mostly focused on immediate changes in the disc position.<sup>1,3,5,7-9</sup> No reports have described long-term postoperative follow-up using MRI for a careful assessment of TMJ disc position changes.

Therefore, this report presents a rare case of TMJ disc position change after orthognathic surgery. Periodic MRI examinations during long-term follow-up enabled a thorough assessment of the pathologic disc position, which was restored to its normal position after surgery and then changed to a pathologic position in a different direction.

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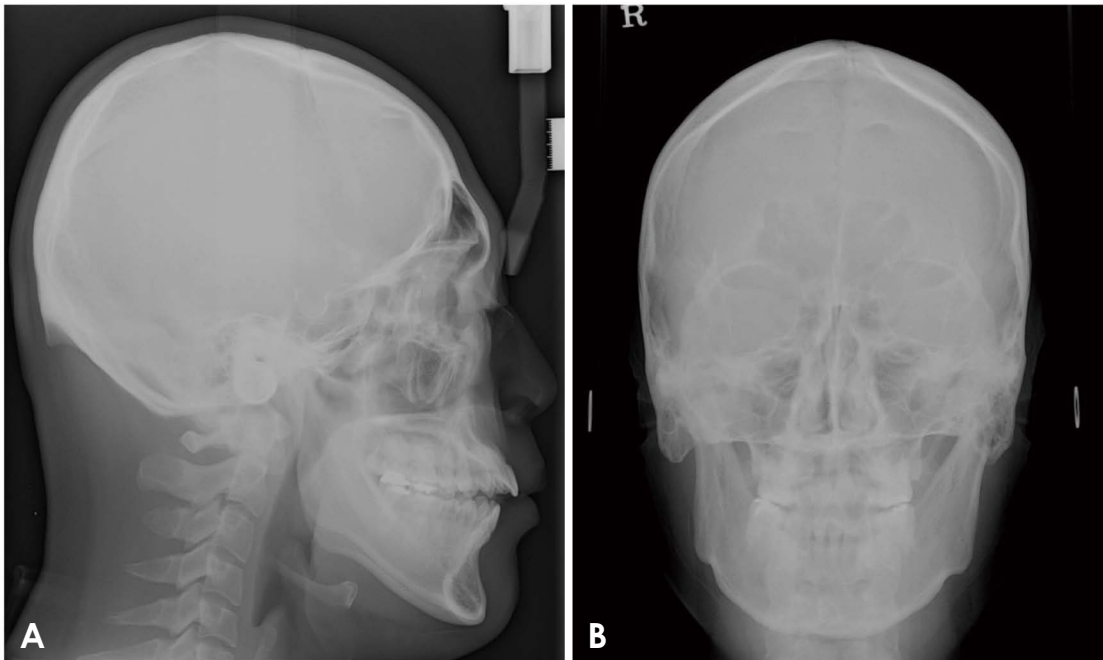
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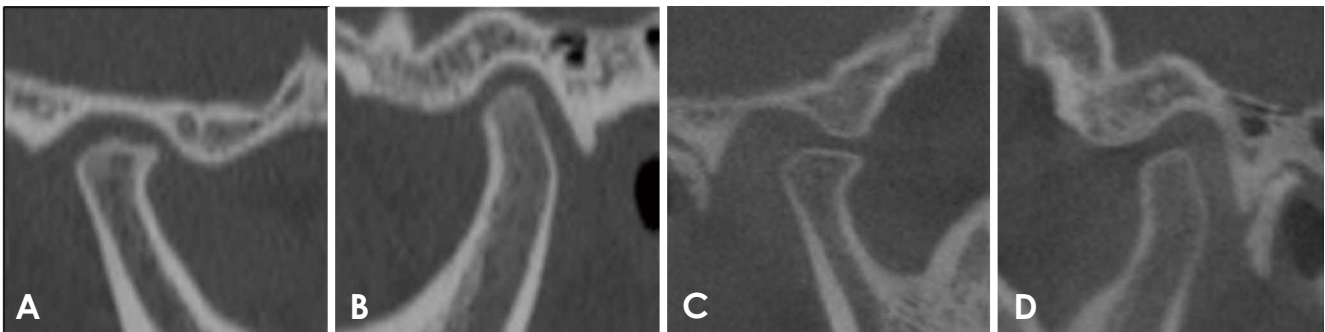
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**Fig. 1.** A. Preoperative lateral cephalometric radiograph shows an anterior open bite. B. Preoperative postero-anterior cephalometric radiograph shows skeletal asymmetry with mandibular deviation to the right side.



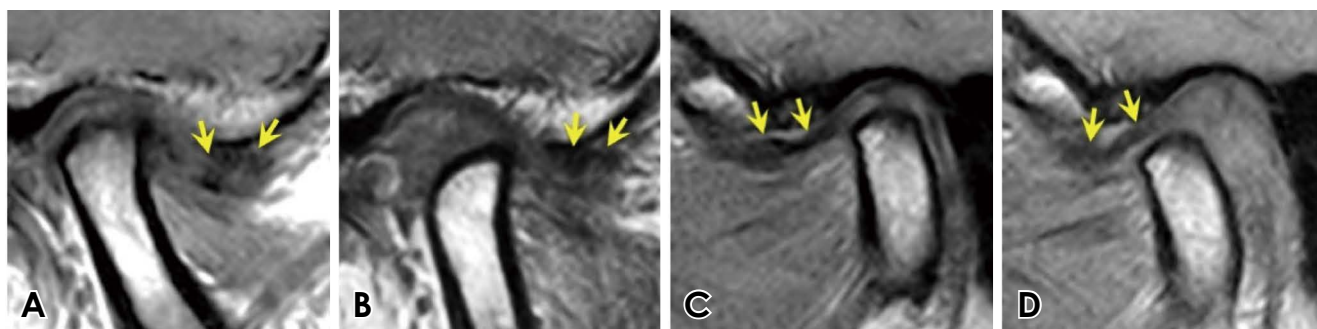
**Fig. 2.** Sagittal view of the temporomandibular joint before and after surgery. A. Computed tomography (CT) images before the surgery present degenerative changes of the condyle in the right temporomandibular joint (TMJ). B. There is no apparent osseous change in the left TMJ before surgery. C. Cone-beam CT images taken 6.5 years after surgery show flattening of the condyle in the right TMJ. D. The left joint remained the same after surgery with no degenerative bone changes.

### Case Report

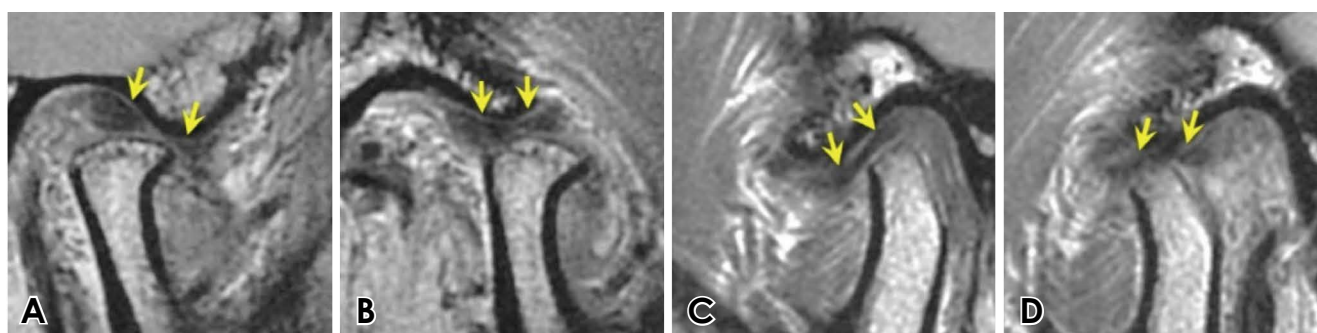
A 22-year-old male patient visited the Department of Oral and Maxillofacial Surgery of Yonsei University Dental Hospital for orthognathic surgery to resolve his facial asymmetry. The patient had no significant medical history. He also complained of pain in the right TMJ region that started 2 years ago and wondered whether surgery would also alleviate the pain. He did not have any bad habits related to TMJ or significant sources of stress.

Occlusion and facial profile analyses revealed that he had an anterior open bite and skeletal asymmetry (Fig. 1).

The choice was made to perform surgery, with pre- and post-surgical orthodontic treatment. TMD was also assessed in multiple imaging modalities. Bone changes in TMJ were evaluated by computed tomography (CT; HiSpeed RP, GE Medical Systems, Milwaukee, WI, USA; tube voltage: 120 kVp, tube current: 80 mA) images and degenerative changes were detected in the right condyle (Figs. 2A and B). The MRI examination (SIGNA Pioneer 3T, GE Medical Systems, Milwaukee, WI, USA; axial T2-Flex, sagittal proton-density [PD] with an open and closed mouth, sagittal T2 at closed mouth with fat suppression and coronal PD with a closed mouth) revealed complete anterior displace-



**Fig. 3.** Preoperative sagittal T1-weighted magnetic resonance images of both temporomandibular joints (TMJ). The disc of the right TMJ is displaced anteriorly during mouth closing (A) and opening (B). The left TMJ disc is also displaced in the anterior direction during mouth closing (C) and opening (D) (arrows, TMJ discs).



**Fig. 4.** Sagittal proton-density magnetic resonance images of the temporomandibular joint (TMJ) at 6.5 years after the operation. On the right TMJ, disc position is within normal range during mouth closing (A) and opening (B). The left TMJ also presents normal disc positions during mouth closing (C) and opening (D) (arrows, TMJ discs).

ment of disc without reduction on the right side and anterior displacement without reduction on the left side (Fig. 3). Both joints showed no evidence of joint effusion. Physical therapy and medication were prescribed for TMD management.

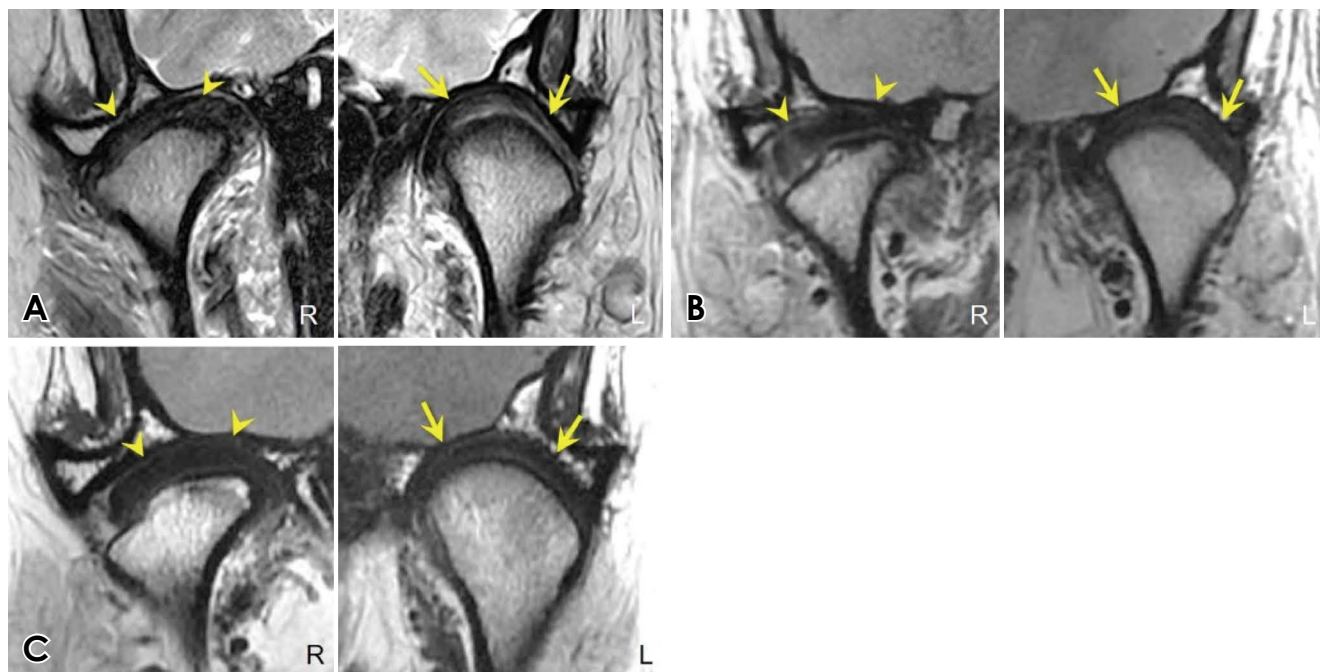
Le Fort I osteotomy of the maxilla and bilateral intraoral vertical ramus osteotomy of the mandible were performed, and the post-surgical healing was uneventful. He was satisfied with the changes in his facial profile, and his pain in the TMJ significantly decreased. Postoperative MRI also showed dramatic improvement of the disc position on a sagittal view (Fig. 4). The disc positions of both joints were within the normal range in the antero-posterior direction during mouth opening.<sup>12</sup> Meanwhile, the position of the right condyle slightly changed anteriorly compared to the preoperative image (Figs. 3 and 4). The right joint disc also showed medial displacement compared to its position before surgery (Figs. 5A and B).

The patient regularly visited the clinic for 2 years and no noteworthy events were detected. At 6.5 years post-opera-

tion, the patient stated that discomfort on TMJ had recurred again, and an MRI examination was performed. On the right side, the disc showed apparent displacement toward the medial side (Fig. 5C). On cone-beam computed tomography (Alphard 3030, Asahi Roentgen Ind Co Ltd, Kyoto, Japan; tube voltage: 80 kVp, tube current: 8 mA, exposure time: 17 seconds,  $154 \times 154$  mm field of view, and voxel size:  $0.3 \text{ mm}^2$ ) images, bone remodeling was observed in the right condyle (Figs. 2C and D). Physical therapy and medication were prescribed for TMJ pain control.

## Discussion

The current study presents sequential changes in the TMJ disc position along with TMJ symptoms after bimaxillary orthognathic surgery. This report is meaningful in that it illustrates long-term changes in the disc position and symptoms, spanning 6 years after orthognathic surgery, which might be one of the longest follow-up periods reported to date.



**Fig. 5.** A. Preoperative coronal T1-weighted magnetic resonance (MR) images show a normal disc position in the right and left temporomandibular joints (TMJ). B. One-year postoperative coronal proton-density (PD) MR images show slight medial disc displacement in the right TMJ and normal disc position in the left TMJ. C. In 6.5-year post-operation coronal PD MR images, medial disc displacement in the right TMJ and normal disc position in the left TMJ are seen (arrowheads, right TMJ discs; arrows, left TMJ discs).

Many previous studies have investigated the influence of orthognathic surgery on TMD, most of which asserted that there is no strong relationship between surgery and TMJ problems.<sup>1,3,5,7-9</sup> Nevertheless, some of the patients reported by Kim et al.<sup>1</sup> previously had anterior disc displacement, but the disc position normalized, which unexpectedly indicates that orthognathic surgery could actually have an impact on the TMJ, although the surgical procedure did not directly manipulate the joint. A systematic review by Al-Moraissi et al.<sup>13</sup> found that the signs and symptoms of TMD significantly improved after surgery. Another study reviewed 500 patients who underwent bimaxillary orthognathic surgery, in which the number of patients with pain or clicking decreased significantly after surgery.<sup>4</sup> In the context of occlusal changes, renewed complete dentures also improved the disc position after 2 years.<sup>14</sup> These studies are in accordance with the findings of this report, with reduced TMJ symptoms and reduction of the disc position to the normal range. However, unlike previous reports, long-term follow-up MRI was available in this report to track gradual changes in disc position, indicating that TMJ symptoms could develop later.

Some studies evaluated the disc position and TMD symptoms in a group of patients with facial asymmetry due to mandibular deviation.<sup>15-17</sup> Unilateral disc displacement was a common preoperative finding (in more than half of the

patients), but the postoperative disc positions were not evaluated.<sup>15,16</sup> In addition, disc displacement was diagnosed based on CT findings,<sup>15,16</sup> not MRI, which is a modality with superior soft tissue contrast to CT. Although disc position changes in patients with facial asymmetry have not been apparently studied via MRI, skeletal class II<sup>7</sup> or skeletal class III patients<sup>5</sup> were evaluated via MRI in previous reports. Thus, further studies are needed to assess disc displacement in facial asymmetry patients, as in this report.

The symptoms of TMD were compared before and after orthognathic surgery in patients with facial asymmetry. Regular follow-up examinations until 1 year after surgery showed a decreasing trend in the number of patients with TMD symptoms.<sup>16</sup> The same tendency was seen in a large group of 170 patients, where the number of patients experiencing TMD symptoms decreased over 2 years after surgery.<sup>17</sup> The follow-up periods in these studies were far shorter than the 6.5-year follow-up in this report, which makes it unique and significant, and this longer follow-up period enabled a more comprehensive evaluation of the patient. TMD symptoms after orthognathic surgery warrant long-term follow-up.

The current report thoroughly evaluated the mediolateral position of the TMJ disc, as well as anteroposterior disc displacement. The discs of TMJs are frequently displaced in

the anterior direction.<sup>18</sup> The patient in this report developed TMD symptoms, as the disc was medially displaced after surgery, but only a few studies have found an association between mediolateral disc displacement and TMD symptoms.<sup>19</sup> This type of disc displacement could be derived from changes in the 3-dimensional relationship between the condyle and articular fossa, which leads to irregular stress distribution in patients with former facial asymmetry even after surgery.<sup>20</sup> In this report, the anteriorly positioned right condyle during surgery caused the distal joint space to widen, leading to re-displacement of the disc in another direction. Therefore, changes in the disc position should be assessed in every direction that MRI can accommodate, and they should be evaluated in relation to changes in the patient's symptoms.

In conclusion, the TMJ disc position might improve after surgery, but long-term follow-up with close evaluation via MRI is needed to assess any recurrence of disc displacement or TMJ symptoms. Furthermore, a comprehensive evaluation of the patient's TMJ symptoms, the surgical procedure to be performed, and the estimated postoperative positions of the condyle and articular fossa should be conducted to accurately predict the influence of orthognathic surgery on the TMJ.

**Conflicts of Interest:** None

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