

# Full Mouth Rehabilitation of a Patient with Bite Collapse in the Molar Area Using Removable Partial Denture and Dental Implant Prosthetics

Jun-Won Hong, Jae-Min Seo, Dong-Hwan Seong, Gwang-Yeop Song,  
Ju-Mi Park, Seung-Geun Ahn

Department of Prosthodontics, School of Dentistry, Chonbuk National University, Jeonju, Korea

## Corresponding Author

**Seung-Geun Ahn, DDS, MSD, PhD**

Professor

Department of Prosthodontics, School of Dentistry, Chonbuk National University  
664-14 Dukjin-dong, Dukjin-gu, Jeonju, Chonbuk, 561-756, Korea

TEL: +82-63-250-2032 FAX: +82-63-270-4004 E-mail: sgahn@chonbuk.ac.kr

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## • Abstract

Dental clinicians often encounter cases wherein the patient's lost molar area was neglected and left untreated for an extended period of time, thereby causing the extrusion of opposite molars and occlusal disharmony as well as occlusion in the anterior teeth and consequently resulting in anterior displacement in the area. Clinicians normally carry out prosthetic treatment via occlusal plane lifting when such becomes absolutely necessary due to the lack of sufficient space needed for prosthetic therapy aimed at proper anterior and lateral induction. In this case report, we examined occlusal disharmony and VDO loss in a patient who had lost his molars and had not received prosthetic treatment for an extended period of time. We treated the maxillary area with dental implant prosthetics and Kennedy Class I RPD and the mandibular area with residual natural tooth-based implant placement and dental implant prosthetics. The patient reported treatment outcomes that were deemed satisfactory both functionally and aesthetically.

• Key word : full mouth rehabilitation, bite collapse, vertical dimension, implant, denture

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## Introduction

If left untreated for an extended period of time, molar loss in dental patients often complicates the implant prosthetic treatment process with roughly two problems: first, occlusal disharmony resulting from the extrusion of the teeth on the opposite arch, and; second, loss of VDO (vertical dimension of occlusion) resulting from the displacement of the anterior teeth caused by molar malocclusion and resulting occlusal force<sup>1)</sup>. If the patient exhibits either case, the treatment considerations will involve not only reconstructing lost tooth or teeth but also restoring occlusal harmony in the remaining teeth as well as proper VDO<sup>2)</sup>.

From the functional point of view, the plane of occlusion in denture should be positioned such that it is used as the plane of grinding during mastication, with the buccal tongue and the buccinator muscle helping the food be placed upon the plane and maintained thereupon during the chewing action. If the occlusal plane is set too high, the food will gather in the labial or buccal sulcus; with the plane set too low, however, the masticating action would lead to buccal and/or tongue bite. From the aesthetic point of view, a properly set occlusal plane will exhibit a natural smile configuration in the maxillary tooth resection plane according to the shape of the lower lip. If the plane is set unskillfully, such failure will be the biggest contributing factor for the “denture look.” Boucher<sup>3)</sup>, Hall<sup>4)</sup>, and Nagle<sup>5)</sup>, et al argued that it would be best if the occlusal plane is positioned parallel to the residual alveolar ridge. On the other hand, Yasaki<sup>6)</sup> stressed that the plane should be at the same height as the dorsal surface of the tongue. Boucher<sup>2)</sup>, and Ismail and Bowman<sup>7)</sup> proposed that the occlusal plane be positioned mid-way in the retromolar trigone or at the two-third point toward the anterior area. Niekerk, et al<sup>8)</sup> and Javid<sup>9)</sup> suggested that the anterior tooth incision line be positioned at the 1mm ~ 3mm site under the upper lip provided physiological stability was secured, with the line set parallel to the ala-tragus line in the molar area.

As for the clinical technique for measuring VDO, methods have been suggested by using the pre-extraction record<sup>10)</sup>, physiological rest position<sup>11)</sup>, swallowing<sup>12)</sup>, innunciation<sup>13)</sup>, and dental aestheticism<sup>14)</sup>. Nonetheless said methods remain the subject of controversies with differing strengths and weaknesses. Arguing the need for an unchanging VDO in his book, Dawson<sup>15)</sup> noted that VDO tends to be determined at the optimal contraction site of the muscle-closing

muscles, and that VDO will be maintained at a constant level via growth of the alveolar process and eruption of the tooth in the event of tooth abrasion. In the case of unavoidable extension of VDO, the author stressed that such extension should be carried out as minimally as possible<sup>15)</sup>.

This case report aimed at investigating a patient suffering from occlusal disharmony and VDO loss resulting from bite collapse caused by long-term molar absence and implementing a treatment scheme that includes dental prosthetics, removable partial denture, and dental implant prosthetics. The publication of the case was decided based on treatment outcomes deemed satisfactory both functionally and aesthetically.

## Case Report

A 69-year-old male patient visited the Department of Prosthodontics at the Chonbuk National University School of Dentistry requesting for the restoration of his lost upper and lower molars. No extraordinary medical history that may interfere with the dental treatment was noted. The clinical and radiological examinations performed during his first visit revealed the loss of a number of teeth in the maxillary and mandibular molar areas. Remaining teeth, too, were found to be in poor shape, with inferior extrusion taking place due to the extended absence of teeth on the opposite arch. Secondary caries was also observed in quite a few teeth under the existing implant prosthetics. The residual roots of the maxillary right second molar and mandibular right second premolar were found to be intact (Fig. 1, 2).

The patient also exhibited bite collapse in the molar areas, resulting in occlusal disharmony, pathological displacement of the anterior teeth, and lack of normal anterior induction and correct tooth induction during lateral mastication. To establish a treatment plan for the patient, we first obtained a snap impression of his teeth and conducted a dislocation of the facial canal and the mounting on a semi-adjustable articulator. Afterward, we analyzed the results of clinical examinations and the model impression on the articulator. To ensure the functionally and aesthetically satisfactory restoration of anterior teeth, we considered an average adult's normal tooth length and horizontal and vertical flap amounts after examining the patient's existing occlusion, which showed a distance of 13mm from the gingival margin



Fig. 1. Panorama X-ray view in 1<sup>st</sup> visit.

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Fig. 2. Intra-oral clinical view in 1<sup>st</sup> visit.

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of the maxillary central incisor. Following the suggestion of Dawson, we then decided an approximately 3mm-long bite raise from the central incisor to ensure minimal raise for inserting the implant prosthetics. After deciding the VDO, we decided to establish the occlusal plane using the alar-tragus line, set the plane via the occlusion-plane template based on Monson's 4-inch spherical theory, and performed a diagnostic wax-up (Fig. 3). After that, we decided to extract the residual roots of the maxillary right second molar and the mandibular right second premolar as well as the upper left first premolar and upper left second molar exhibiting severe mobility. Based on panoramic images, bone mass on the right-hand side was found to be extremely scanty; thus indicating the need for massive bone grafting to ensure effective treatment. We also exchanged opinions with the patient regarding our treatment plan, addressing the possibilities of extended periods of treatment and

complexity of the surgical procedure. In the end, we decided to carry out dental implant prosthetics in the maxillary area using the patient's residual natural teeth as well as Kennedy Class I RPD. For the mandibular area, we opted for dental implant prosthetics using the patient's natural teeth and dental implant prosthetics aimed at full-mouth restoration accompanying occlusal correction.

The patient's bite model as created from the diagnostic wax-up was reproduced, and a template for temporary teeth was pre-fabricated using a 1mm thermoplastic soft shell (COPYPLAST®, Scheu Dental GmbH, Iserlohn, Germany). During his follow-up visit, the existing prosthetics were removed, and the upper right second molar, upper left second premolar and first molar, and lower right second premolar were extracted (Fig. 4). The patient's residual abutment teeth were subjected to restorative treatment - which included endodontic therapy as necessitated by



Fig. 3. Diagnostic model and diagnostic wax-up.

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Fig. 4. Old prosthesis removal.

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Fig. 5. Temporary prosthesis fabrication.

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Fig. 6. Final teeth preparation.

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Fig. 7. Bite registration by using temporary prosthesis.

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severe caries in said teeth – at the Department of Conservative Dentistry at the Chonbuk National University School of Dentistry. The residual teeth were also subjected to temporary prosthetics using acrylic resin (Tokuso Curefast, Tokuyama Dental Co., Tokyo, Japan) to achieve the planned VDO. We checked on the VDO for temporary dental implant prosthetics to be performed in the molar area, fabricated said prosthetics, and installed in the patient the following day.

We evaluated the stability of the changed VDO and occlusal plane by performing endodontic treatment throughout the temporary prosthetics installation period on the upper right first premolar, canine, lateral incisor and central incisor, and upper left central incisor and canine that had exhibited severe caries as well as on the lower left first and second premolars and lower right canine that had shown extremely severe post-resection sensitivity. In addition, we placed a 4.1 x 10mm implant (ITI Standard, Straumann AG, Basel, Switzerland) in the mandibular left second premolar, first molar, and second molar as well as in the lower right first molar and second molar. Three months after the implant placement, we measured the ISQ of the implants, installed temporary acrylic resin prosthetics for a month-long trial, and allowed for a 4-month installation period during which the temporary prosthetics was maintained (Fig. 5).

After the 4-month installation period for the temporary prosthetics, we observed stability in the corrected VDO and occlusal plane; thus, we proceeded with the final prosthetic treatment. The final treatment involved two stages: (a) dental implant prosthetics for the natural teeth in the anterior area, and; (b) maxillary RPD and mandibular implant prosthetics in the molar area.



Fig. 8. Master model mounted on semi-adjustable articulator.

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For the natural tooth-based dental implant prosthetics in the anterior area, we performed final resection based on the temporary prosthetics in the molar area (Fig. 6) and obtained an impression using polyvinylsiloxane impression material. Afterward, we fabricated the master die, manufactured the maxillary bite agent in the die, tried it out and obtained the bite impression, and carried out the mounting via facial canal dislocation (Fig. 7, 8). We then performed full contouring wax-up in the form of the final prosthetics, performed surveying on the insertion passageway of the partial denture, and conducted a cut-back (Fig. 9). Afterward, we tried metal coping from the casting inside the oral cavity, performed porcelain buildup; and bonded it inside the oral cavity using adhesive resin cement (RelyX Unicem, 3M ESPE, Seefeld, Germany) (Fig. 10).

For the prosthetic treatment in the molar area, we obtained a temporary impression of the maxillary area, fabricated the

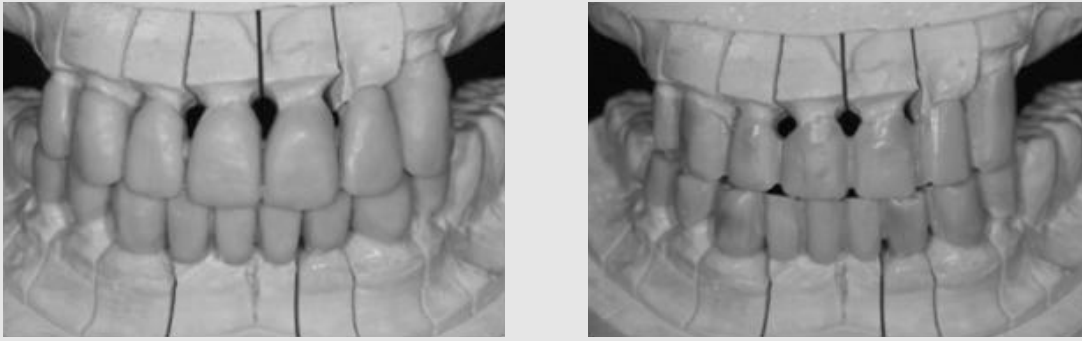


Fig. 9. Full contouring wax-up and Cut-back for metal coping.

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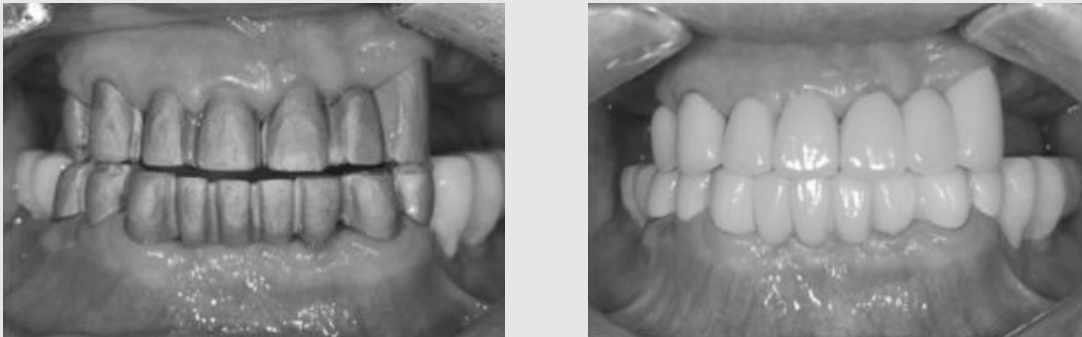


Fig. 10. Fixed prosthesis metal coping check and final prosthesis.

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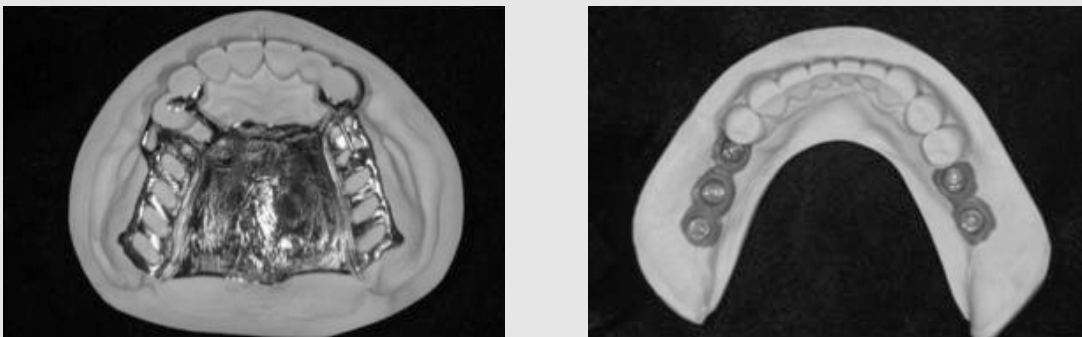


Fig. 11. Master model for RPD and implant prosthesis, and RPD framework.

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individualized tray, and performed a bite raise using polyvinylsiloxane impression material based on the conventional method. For the implant prosthetics in the mandibular area, we used the same type of impression

material to perform a bite raise via the transfer type's impression coping, and then fabricated the final model. According to the conventional design concept of partial denture, we chose an RPI bar as supporting device in the



Fig. 12. Bite respiration for posterior part and wax denture try-in.

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Fig. 13. Clinical remounting (mutually protected occlusion).

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right first premolar and a wrought wire for the left canine. For the main connection device, we opted for the plate type that does not cover the anterior teeth; for the rest, we provided additional rest in the right canine for the abutment teeth and for indirect support. Following the framework design, we used Co-cr alloys to fabricate the framework (Fig. 11). Afterward, we tried the framework inside the oral cavity, installed the wax bonding agent in the framework, raised the bite for the molar prosthetics, and performed facial canal dislocation and mounting for the second time. We then arranged the resin artificial teeth, fabricated the screw type's dental implant prosthetics, tried the maxillary model inside the oral cavity, and conducted the final evaluation (Fig. 12).

By using the acrylic resin for thermal polymerization and ensuring curing for the denture, we raised the intra-oral bite and carried out occlusal adjustment to ensure canine-

induced, mutually protective occlusion in the central site during lateral mastication via clinical remounting enabled by equal occlusal dispersion in the molar area (Fig. 13). Afterward, we installed the removable partial denture in the maxillary area and the dental implant prosthetics in the mandibular area as the final stage of the treatment (Fig. 14, 15).

Following the prosthetic installation, we had the patient revisit our clinic at Week 1, Week 2, and Week 4 for follow-up observations. We checked on the stability of the occlusion, normality/abnormality status of TMJ, and presence/absence of mechanical damages to the prosthetics. When necessary, we performed occlusal adjustment for him. The patient expressed satisfaction with the final prosthetics in terms of functionality and aesthetics.

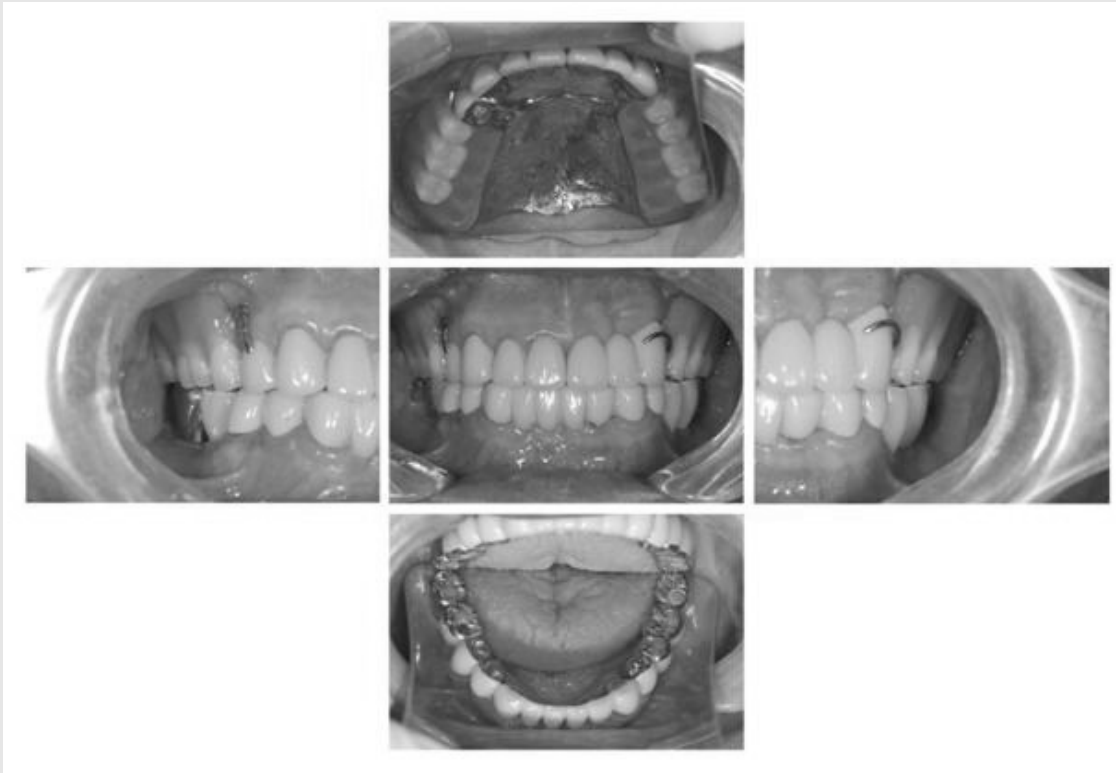


Fig. 14. Intra-oral clinical view in final delivery.

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Fig. 15. Panorama X-ray view in final delivery.

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## Discussion

This case report dealt with a patient who suffered from VDO loss caused by the loss of molars and extended periods of neglect in the area as well as the resulting occlusal disharmony and dislocation of the anterior teeth. Initially, the patient expressed a need for dental implant prosthetics. Note, however, that the nearly total absence of the maxillary right residual alveolar ridge and bone in the maxillary sinus necessitated performing massive bone grafting during implant placement, extensive surgical treatment, and extended period of healing as we saw fit. After adjusting our opinions with those of the patient, we treated the maxillary area with dental implant prosthetics in the anterior teeth and Kennedy class I RPD in the molars. For the mandibular area with relatively sufficient residual bone mass found in the edentulous space, we carried out dental implant prosthetics in the anterior teeth using the patient's residual natural teeth as abutment teeth as well as dental implant prosthetics using the posterior implants. We decided to recreate the VDO and occlusal plane via full-mouth restoration.

During the determination of his VDO, the patient did not complain of any particular TMJ-related pain. Based on our full-face analysis via anatomical measurement, we ruled out severe VDO loss. To ensure satisfactory occlusal harmony, however, we decided not to perform the bite raise and instead opted to carry out the fabrication of prosthetics with proper Spee's curvature and the curve of Wilson. Thus, prior to the prosthetic therapy, we conducted facial canal dislocation and diagnostic wax-up and decided the minimum amount of bite raise needed to fabricate the prosthetics that will be satisfactory functionally as well as aesthetically. For the reference plane, we used the patient's ala-tragus line and interpupillary line as well as the occlusion plane template based on Monson's 4-inch spherical theory to carry out diagnostic wax-up.

We delivered to the patient the VDO and occlusal plane

established as above via temporary prosthetics. We also performed the endodontic treatment and implant procedure, followed by follow-up monitoring on the patient's adjustment to the prosthetics throughout the healing period. Once we confirmed the stability of said VDO and occlusal plane in the patient, we proceeded to fabricate the prosthetics for the anterior teeth and molar area in accordance with the conventional methods, and then installed them in the patient.

In our treatment that aimed at occlusal correction, we found the diagnostic process using facial canal dislocation and diagnostic wax-up essential in checking the prognosis of the final treatment. Precision-fitting temporary prosthetics is considered a process requiring surgeons to pay particular attention during fabrication because it is helpful in their determination of the patient's adjustment status, evaluation of aesthetic performance, and level of occlusal bite formation as intended including securing stability in obtaining a bite impression during the final prosthetic fabrication.

## Conclusion

In this case report, we treated a patient who, due to the loss and neglect of his molar teeth, complained of occlusal disharmony and lacked sufficient space where implant prosthetics was to be placed to ensure functionally as well as aesthetically satisfactory outcomes. As part of our treatment, minimal bite-raising was performed to secure the ala-tragus line and the prosthetics; the maxillary area was treated with dental implant prosthetics and removable partial denture, with the mandibular area restored via implant prosthetics (natural teeth) and dental implant prosthetics. The treatment outcomes included stable bite as well as functional and aesthetic satisfaction expressed by the patient.

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