

<Title>

A case report in which chief complaints were improved by applying the undersized drilling technique and GBR to the maxillary anterior edentulous region

< Objective>

A symposium held at the University of Toronto in 1998 focused on the criteria for successful implant treatment, and found that steady support for a functional and aesthetic superstructure is required. However, tooth loss in the maxillary anterior region and the resultant bone resorption cause reduction of the alveolar ridge. Consequently, when we rehabilitate it by implant treatment to improve the chief complaints of patients such as aesthetic problems and mastication disorder, we commonly encounter challenging clinical cases. In this presentation, I would like to report on a case I experienced, which involved a maxillary anterior edentulous region with three missing teeth and was diagnosed as presenting with inadequate labial alveolar bone volume. A good clinical course was observed by performing an implant treatment combining the undersized drilling technique and guided bone regeneration, or GBR, which improved the chief complaints related to aesthetics and mastication as well as preservation of natural teeth.

<Case Summary>

The patient was a 55-year-old man with the chief complaints of aesthetic problems and mastication disorder due to anterior maxillary tooth loss. He wished to receive implant treatment and was referred to my clinic in February 2013. Bridges attached to the maxillary anterior teeth had kept coming off several times. Teeth 13, 22, and 23 showed widened periodontal membrane space presumably caused by occlusal trauma due to upward force exerted by mandibular anteriors, but these teeth were diagnosed as preservable. Gingival biotype in region 11 was thin with decreased width of keratinized mucosa, but other sites showed no problem. Preoperative examination and diagnosis by CT using simulation software indicated bone quality Class II for regions 12 and 21, and Class IV for region 11 by the Hämmerle and Jung classification system. Subsequently, in June 2013, two Platon implants with a diameter of 3.3 mm and length of 10 mm were placed in the edentulous regions 12 and 21 using the undersized drilling technique as indicated in the treatment plan. The initial fixation of the implant bodies was satisfactory. In the edentulous region 11, GBR was performed for aesthetic reasons. In December 2013, a final impression was made and zirconia crowns were attached with temporary cement. The treatment was performed after obtaining informed consent of the patient, who also agreed to have the case published.

These intraoral photographs were taken at the patient's first visit in February 2013. He had had several bridges made for maxillary anterior teeth at another clinic because the bridges came off

frequently and had to be fabricated and attached repeatedly. Tooth 11 had been extracted a few months earlier because of root fracture, and Seibert's Class III labial concavity of gingiva was observed.

This is a panoramic radiograph taken at the initial examination. Root canal filling had been performed in teeth 13, 22, and 23 at the dental care facility that referred the patient to my clinic. Widening of the periodontal membrane space was noted. It was presumably caused by occlusal trauma due to upward force exerted by mandibular anteriors, but these teeth were diagnosed as preservable. Generalized bleeding was observed on probing around natural teeth, indicating moderate periodontitis with the periodontal pocket depth of 4 mm. Therefore, I started the rehabilitation with preliminary periodontal treatment, namely scaling and root planing, before the placement of implants.

There are preoperative intraoral photographs. The patient wished to receive implant treatment to improve the chief complaints of aesthetic problems and mastication disorder as well as to save the maxillary anterior natural teeth. Gingival biotype in region 11 was thin with an inadequate width of keratinized mucosa, but other regions had enough keratinized mucosa width, so there was no problem in those areas.

Preoperative examination and diagnosis by CT using simulation software showed that alveolar bone morphology in regions 12 and 21 was Class II by the Hämmerle and Jung classification system, indicating inadequate labial alveolar bone volume in both regions. Additionally, these regions were diagnosed as having low bone mineral density based on the CT values obtained in these areas. Region 11 was assessed as Class IV, indicating that there was not enough alveolar bone volume to place an implant body. Based on the results obtained from the simulation data, a treatment plan was designed so that a final prosthesis in the form of a bridge would be inserted to replace the three missing maxillary anteriors, with regions 12 and 21 rehabilitated with implants and region 11 with a pontic. As the surgical procedure, I used the undersized drilling technique to achieve good initial fixing of the implant bodies. I wonder what kind of treatment option is used at Indiana University to treat such cases. Because of the anatomical characteristics of Asian populations including the Japanese, if implants are being placed after bone augmentation by GBR in patients with a major alveolar bone defect as in region 11 here, the interimplant distance is prone to become 3 mm or less in many clinical cases in Japan. Because such a narrow distance inhibits the formation of interdental papilla-like tissue, the primary approach in Japan nowadays for such cases is to use pontics.

The implant placement surgery was performed in June 2013 in accordance with the treatment plan. Incisions were made lingually on the crest of the alveolar ridge to preserve keratinized gingiva. Releasing incisions were made and flaps were elevated while paying attention to ensure that sufficient flap distensibility was obtained. Subsequently, two implant bodies were placed in

regions 12 and 21 using the undersized drilling technique, which achieved stable initial fixation. For region 11, GBR was performed to improve the aesthetic appearance. After perforating the labial cortical bone with a round bur, Bio-Oss was grafted densely and resorbable membrane was placed to obtain the maximum height and width of the alveolar ridge, then the mucoperiosteal flaps were sutured.

This slide shows the state of the labial gingiva in November 2013, at 5 months after the surgery. Restoration of interdental papilla-like tissue was observed in the region between 12 and 21, along the longish abutments that had been in place. Additionally, direction indicators confirmed that the implant bodies were inserted at the ideal three-dimensional positions as predicted by the simulation.

Here you can see the occlusal surface. The alveolar ridge defect in region 11 was improved morphologically compared to the preoperative status, gaining sufficient height and width to insert a final aesthetic prosthesis.

A provisional restoration was attached so that the interdental papilla of the labial gingiva and the marginal gingiva could achieve a harmonized gingival architecture.

After attaching the provisional restoration and ensuring that the interdental papilla of the labial gingiva and the marginal gingiva had achieved harmony, a final impression was made in December 2013 and a final prosthesis, namely, zirconia crowns, was inserted with Shofu HY-BOND temporary cement. The patient was instructed to wear a night guard to prevent bruxism at night.

These photographs compare the pre- and post-implantation intraoral status of the patient. The chief complaints of aesthetic problems and mastication disorder were improved and, simultaneously, the maxillary anterior natural teeth have successfully been preserved. Since the final prosthesis was inserted, the patient has been receiving postoperative maintenance mainly for plaque control and occlusal examination once every three months.

These photographs are intraoral views as of March 2017, which is 3 years and 3 months after insertion of the final prosthesis. There are no signs of inflammation in the interdental papilla in the maxillary anterior region and the marginal gingiva, and the status has remained stable. The maxillary anterior natural teeth are also in good condition, exhibiting no signs of inflammation.

<Here is a panoramic radiograph of the case. There are no signs of peri-implant bone resorption showing inflammation. The widened periodontal membrane space in the maxillary anterior natural teeth, which was noted at the time of initial examination, has disappeared.

<Discussion and Conclusion>

In this clinical case, the maxillary anterior region with three missing teeth was diagnosed as having inadequate labial alveolar bone volume and decreased bone mineral density based on the simulation data and the CT values, respectively, obtained before surgery. Consequently, GBR

was performed to improve the aesthetics of an edentulous region and two implants were placed in other edentulous regions using the undersized drilling technique for achieving good initial fixation, thus successfully improving the chief complaints of aesthetic problems and mastication disorder and preserving the maxillary anterior natural teeth. This demonstrates that developing a treatment plan based on accurate analysis of the information obtained from simulation data is important when performing implant treatment.