

Case Report

Prosthodontic Rehabilitation of Edentulous Patients with Implant-Retained Overdentures : A Clinical Report

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Abstract

Diminished ridge dimensions following tooth loss complicate prosthodontic rehabilitation, especially for edentate elderly patients who are usually not the right candidates for complex treatment procedures. Implant-retained or -supported overdentures can enhance the stability and retention of conventional complete dentures and rebuild the soft tissue profile and oral function through a relatively conservative procedure. The Locator system (Zest Anchors, Inc, homepage, Escondido, CA, USA) is widely applied around the world as the anchorage for overdentures. The aim of this clinical case report was to demonstrate the rehabilitation of an edentate patient with maxillary and mandibular implant-retained overdentures and to review the related literature.

Key words: dental implants, edentulous mandible, edentulous maxilla, locator, overdenture

Introduction

Life expectancy has improved in most nations in recent years, especially developed countries such as Japan and Singapore, among others, due to advances in medical knowledge as well as clinical techniques. According to the 2015 world population data sheet from the website of the Ministry of the Interior of Taiwan, the life expectancy at birth in 2015 was estimated to be 77 years for males and 84 years for females in Taiwan¹. Therefore, it is expected that the population of elderly people who generally suffer from a higher risk of losing their teeth due to oral diseases will gradually increase in the future. It is thus urgent to consider how quality of life relating to oral health, as well as medical and psychosocial conditions, can be enhanced for this growing population.

The loss of teeth usually results in dimensional changes to the residual alveolar ridge that make it more complicated to rehabilitate the function and esthetics of dentition with either conventional removable dentures or prostheses assisted with implants²⁻⁴. At the same time, the ongoing development of widely accepted and evidence-based tissue preservation and regeneration methods involving the use of various advanced materials and techniques have made it realistic for dental clinicians to utilize fixed implant-supported prostheses in a variety of clinical situations^{5,6}. However, many patients do not choose fixed prostheses as a reconstruction



Fig. 1. The patient's existing dentures became loose due to poor adaptation to the underlying tissue, which had undergone dimensional alteration due to ridge resorption. Retention of his maxillary RPD was further compromised after 13 was extracted.

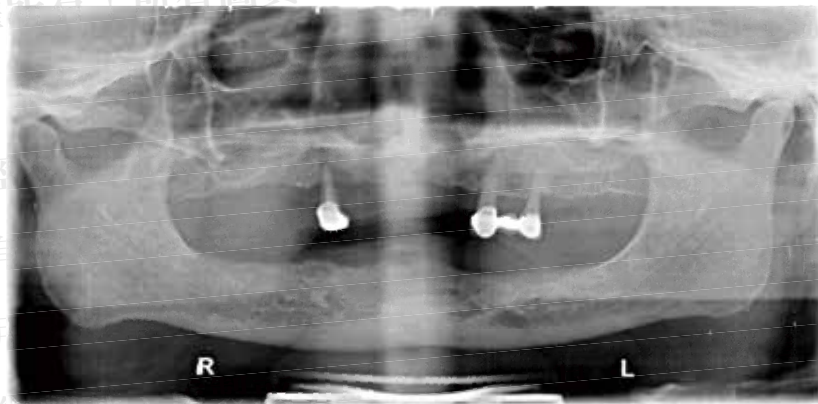


Fig. 2. Panoramic film showing pronounced pneumatization of the right maxillary sinus. The remaining teeth displayed advanced horizontal bony resorption and 13 with old endo and apical radiolucent lesion noted. The mandibular intercanine area exhibited sufficient bone height for implant placement.

plan after considering the associated cost, treatment time, possible surgical procedures, and various other factors^{8,9}.

It has been proven that overdentures retained or supported by implants can promote the stability and retention of conventional complete dentures, especially in the case of mandibular dentures, which frequently cause patients frustration due to advanced alveolar bony resorption. Implant-supported/retained overdentures (IODs) can be utilized with a relatively conservative procedure to rebuild the soft tissue profile and oral function; moreover, due to the additional support provided by the residual ridge, fewer implants are required and, thus, IODs are sometimes more economical and practical from patients' perspectives^{10,11}.

The aim of this clinical case report was to demonstrate the rehabilitation of the esthetics and masticatory function of an edentulous patient through the application of maxillary and mandibular implant-retained overdentures.

Case report

A 71-year-old male patient was referred by the Oral & Maxillofacial Surgery (OMS) Department of Taipei Medical University Hospital (Taipei,

Taiwan) for full mouth rehabilitation treatment. The patient had adapted well to his old maxillary removable partial denture (RPD) and mandibular complete denture (CD) for several years, but the old dentures had recently become loose (Fig. 1). The patient also had well-controlled type II diabetes and hypertension, without any drug or food allergies. Observation indicated that the patient's maxillary RPD was poorly retained due to the loss of the pivot abutment tooth, 13, which was extracted at the OMS department and, furthermore, that ridge resorption had also contributed to deteriorating stability and retention of both dentures (Fig. 3). Clinically, only a 23 × 25 bridge remained, and it had grade II mobility. Moreover, teeth 23 and 25 displayed advanced horizontal bony resorption on the periapical radiograph, while a panoramic film showed pronounced pneumatization of the right maxillary sinus, accounting for the further reduction of the ridge dimension there compared with the left side (Fig. 2). Two treatment options were suggested: (1) maxillary and mandibular CDs or (2) implant-retained palateless maxillary and mandibular overdentures. The patient preferred the palateless design and demanded more retention; thus, he chose the option 2.

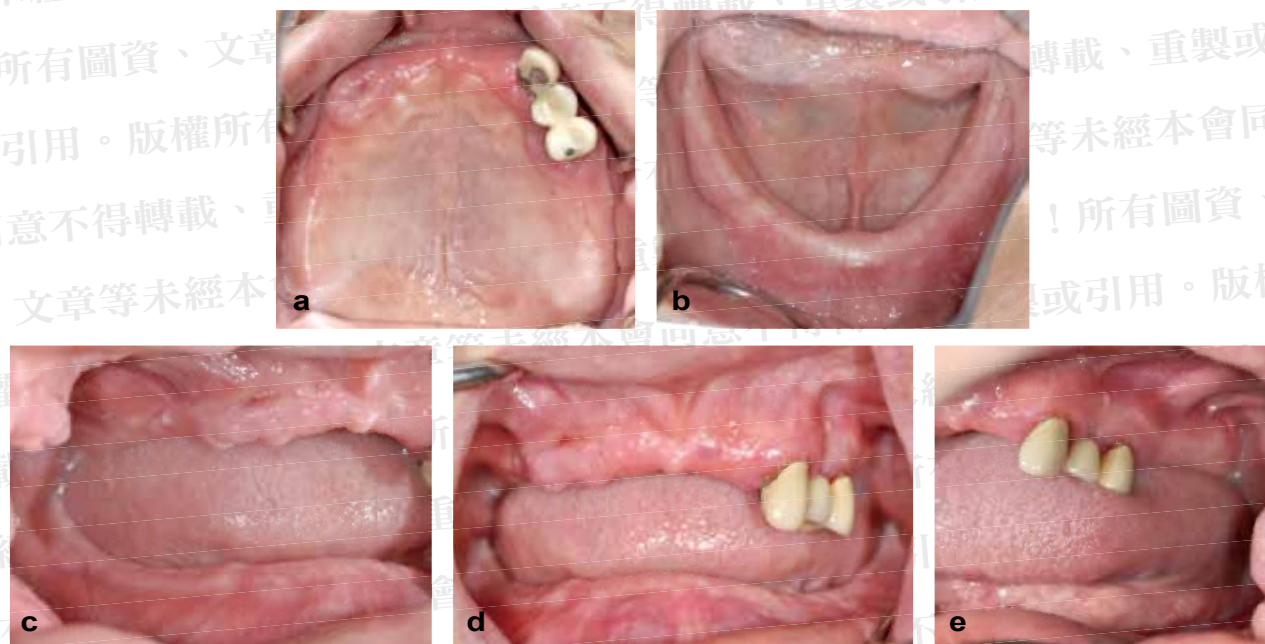


Fig. 3. (a) Occlusal view of maxillary arch showing 23x25 bridge with porcelain chipping. (b) Occlusal view of mandibular arch indicating adequate bone width for implant placement over the intercanine area. (c) Right-side view showing moderate resorption of the maxillary edentulous ridge. (d) Frontal view of both arches. (e) Left-side view exhibiting the patient's enlarged tongue with a retracted tongue position.

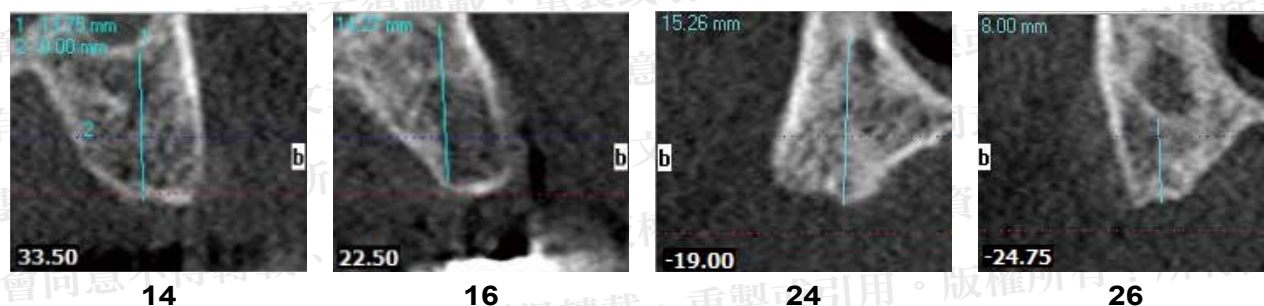


Fig. 4. Cone beam computerized tomographic scan showing sufficient amount of alveolar bone for installing implants over the 14, 16, 24, 26 areas.

After we reached an agreement with the patient, preliminary impressions of both arches were taken and immediately poured with type IV stone. At the next appointment, facebow transfer and centric relation recording was completed for the mounting of the casts on the articulator in the laboratory. Artificial teeth were arranged on the record base for the diagnostic wax-up, as well as for the fabrication of maxillary and mandibular surgical templates. Before the surgical procedure, a cone-beam computerized tomographic scan was arranged to allow for an analysis of the alveolar bone condition and in order to plan the implant positions (Fig. 4). The mandibular intercanine area was manually examined, revealing adequate bone width (Fig. 3), while a panoramic radiograph was used to verify the presence of sufficient

bone height (Fig. 2). After extraction of the 23 × 25 bridge, four implants (Osseospeed™ TX, Astra Tech, Dentsply Implants, Mölndal, Sweden) were placed over the bilateral 1st premolar and 1st molar regions of the maxilla, and two implants were placed over the bilateral canine positions of the mandible through a two-stage protocol (Fig. 5). Parallelism of the implants was accomplished with the application of direction indicators during the osteotomy. Post-operatively, amoxicillin (500 mg) and Ponstan (500 mg) t.i.d. were prescribed for the patient for 7 days. One week later, the patient's existing dentures were repaired and relined with tissue conditioner (GC Soft-Liner, GC Corp, Tokyo, Japan) to serve as the interim prostheses.

The second-stage surgery was carried out 4

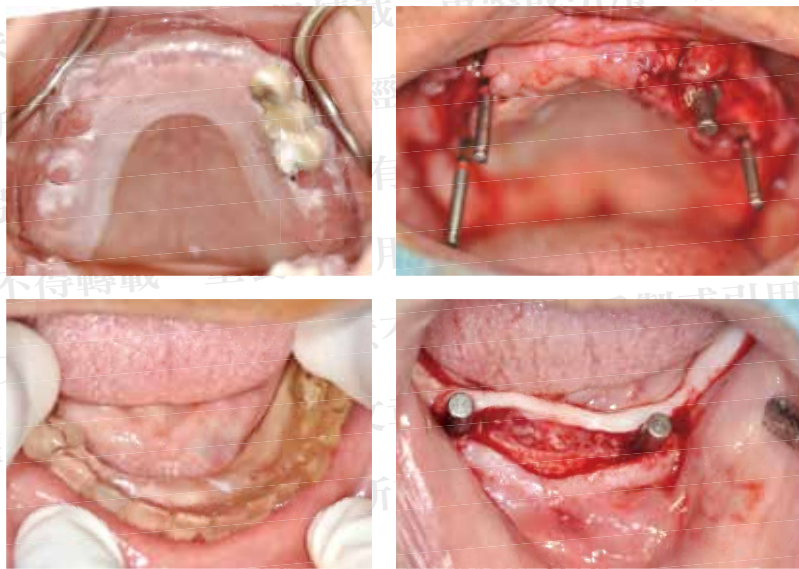


Fig. 5. Four implants were placed over the bilateral 1st premolar and 1st molar region of the maxilla (three OsseoSpeed™ TX 3.5S/9 implants and one 3.5S/11 implant), and two implants were placed over the bilateral canine positions of the mandible (two 3.5S/9 implants).

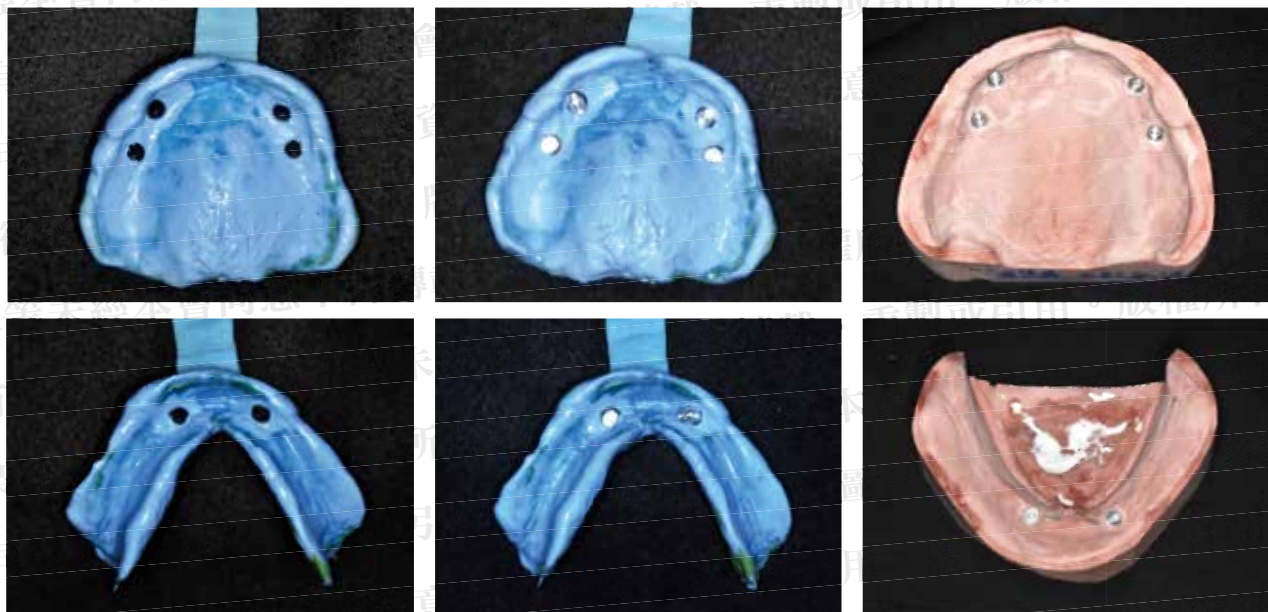


Fig. 6. Abutment-level impressions of the maxillary and mandibular arches were completed by using customized trays with Exadenture. The master casts were fabricated with type III stone after attaching the Locator Abutment Replicas to the black processing caps.

months after the initial surgery, and healing abutments were connected to the implants by the OMS department. Later on at the prosthodontic department, Locator abutments (Zest Anchors, Inc, Escondido, CA, USA) were attached to the implants individually and tightened with a torque wrench (25 Ncm). After we molded the customized trays with green modeling compound (Impression Compound Sticks; Kerr Corp, CA, USA) to obtain fair border sealing, final impressions were made with Exadenture (GC Corp, Tokyo, Japan) and black processing caps were picked up following the manufac-

turer's specifications. Before pouring the master casts with type III dental stone, we connected the Locator Abutment Replicas to the processing caps (Fig. 6). Because the esthetics and occlusion of the patient's old dentures were unsatisfactory, it was imperative to reassess the occlusal plane and vertical dimension of the definite dentures with the wax rim and recording bases. Bite registration of the centric relation was done with aluwax (Aluwax Dental Products Corp, Michigan, USA). The maxillary anterior teeth (Ivoclar Vivadent, Schaan, Liechtenstein) were arranged according to esthetics along with phonetics; as for



Fig. 7. Bite registration of the centric relation was done with aluwax. The maxillary anterior teeth were arranged according to esthetics and phonetics; as for the posterior teeth, their positions conformed to the occlusal plane determined by the wax rim paralleling Camper's line.



Fig. 8. The maxillary over-denture was designed with a horseshoe shape. Locator matrices were attached to the acrylic bases with black processing inserts.

the posterior teeth, their positions conformed to the occlusal plane that was determined by the wax rim paralleling Camper's line (Fig. 7). A bilateral balanced occlusal scheme was applied. After the esthetics and occlusion of the wax dentures were verified clinically, the maxillary and mandibular dentures were processed with poly methyl methacrylate resin (Lucitone 199, Dentsply International Inc, York, PA) and the Locator matrices were attached to the acrylic bases according to the manufacturer's protocol in the laboratory. At the appointment for the delivery of the definite dentures, the adaptation of

the acrylic denture base, the extension of the denture border, and the occlusion were examined and adjusted clinically (Fig. 8).

One month later, after the patient had gradually become accustomed to the new dentures, the black processing inserts were replaced with Locator patatrix nylon inserts (blue, 680 g) according to the manufacturer's protocol. The patient was instructed regarding denture hygiene care and asked to make future appointments for clinical maintenance.

At the one year follow-up appointment, the tissue condition and prosthetic restoration were evalu-

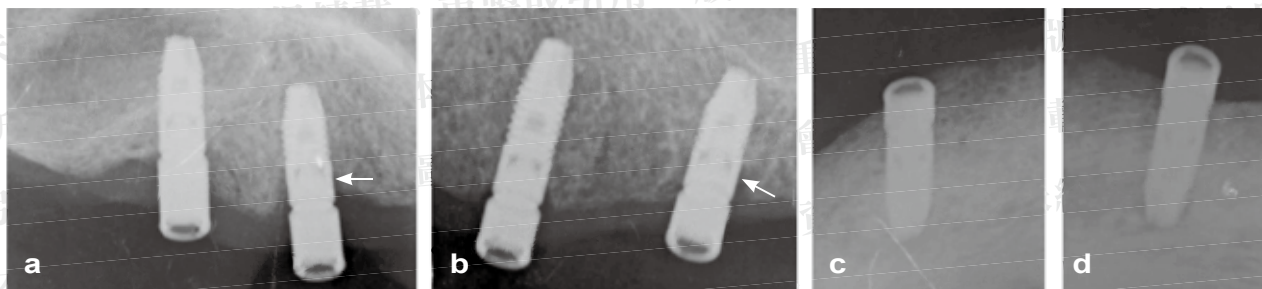


Fig. 9. Periapical radiographs taken at the one year follow-up showing that marginal bone loss was more pronounced at the maxillary implants (a & b) (white arrow) compared with the mandibular ones (c & d), which showed a favorable condition with a quite stable bone level.

ated. We found significant wear on the patrix nylon inserts and so replaced them with new ones. Though the peri-implant tissue appeared quite healthy clinically, a radiographic examination showed more marginal bone loss around the maxillary implants compared with the mandibular ones (Fig. 9).

Discussion

In this case, we applied IODs as the reconstruction therapy for an edentate male patient after considered his oral condition and general health condition. The patient had previously had good experiences with removable prostheses and soon accommodated himself to the new overdentures, which were assisted by four implants in the maxilla and two implants in the mandible. This outcome was consistent with previous studies reporting that people are usually more satisfied with IODs than with conventional removable prostheses¹⁰⁻¹².

According to a meta-analysis study performed by Kodama et al., the application of two-implant retained overdentures in mandibles significantly improves the oral health-related quality of life when compared to the application of conventional ones. Though maxillary implant-retained/supported overdentures frequently served as the mitigation plan for the failure of implant-supported fixed prostheses in earlier studies and displayed lower implant survival, more recent studies support the clinical effectiveness of their use in maxilla on the condition that a reasonable analysis of the restoration space and bone condition is conducted during the diagnostic phase and that implants with moderately rough surfaces are used in optimally distributed positions¹²⁻¹⁴. In our case, we planned the implant positions according to the bone quantity in the molar to canine area, which was limited by the compromised bone volume resulting from sinus pneumatization in the posterior region, and distributed the implants more evenly with a wider anteroposterior spread.

With regard to the necessary number of im-

plants for overdentures, it seems that two implants are required for mandibular IODs in order to improve the retention and stability of conventional dentures and for the acceptable survival of the implants and prostheses^{11,15}. As for the maxilla, it appears that at least four to six implants are needed to achieve a more predictable and successful treatment outcome^{12,14}.

At present, many studies have shown that both solitary and splinted anchorages have their advantages and disadvantages, and we applied the Locator system as the attachment for the overdentures after considering its good retentive force, self-alignment characteristics, and the convenience of its clinical maintenance. The Locator system is widely applied around the world and has proven to be a predictable and reliable anchorage for IODs^{16,17}.

In the present case, there was more marginal bone resorption around the maxillary implants than around the mandibular implants. Many previous studies had investigated marginal bone loss around the implants for overdentures and several impactful factors were suggested, including smoking, bone quantity, and GBR^{18,19}. Though the impacts of implant distribution and attachment design on marginal bone loss in the maxilla have not been conclusively determined²⁰, the less favorable conditions (that is, the inferior bone quantity and quality, namely, type III or IV) of the posterior maxilla in which the implants were placed in the current case and the use of solitary anchorage without positive load sharing may have been the reasons why more marginal bone resorption occurred around the maxillary implants. Nonetheless, our patient adapted well to his new IODs and was quite satisfied with their improved retention and plateless design. Implant-retained/supported overdentures can rehabilitate edentate patients with acceptable esthetics and function at a relatively low cost and with more conservative treatment procedures, supporting their use as an effective prosthodontic solution for many elderly patients.

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