

Individual Implants-Retained Maxillary and Mandibular Overdentures with Limited Vertical and Horizontal Space: A Clinical Case Report

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Abstract

Many clinical cases and literature review have revealed the implant-retained-overdentures (IROs) treatment success and predictability in elderly patients. According to the previous studies IROs treatment in maxillary arch prefer implants connected by a bar, while in mandibular arch the first option is to use un-splinted implants when 2 implants have been inserted. The aim of this clinical case report is to present prosthetic rehabilitation of both maxillary/mandibular arches with IROs. In this report four individual implants retained maxillary overdenture, and two individual implants retained mandibular overdenture were fabricated, due to the lack of sufficient vertical crown height space (CHS) and horizontal space. The patient was followed-up for more than 24 months with no complications.

Keywords: Dental Implants; Implant-Supported-Dentures; Denture Precision Attachments, Implant-Retained-Overdentures

Introduction

Tooth loss of multiple reasons, predominantly caries and periodontal disease, which leads to early edentulism is associated with residual ridge resorption both in horizontal and vertical direction, and affiliated complications of removable denture use. Beyond the physiological sequels of continued resorption of the jaws, altered facial esthetics, phonetics, collapse of vertical dimension, and reduced masticatory function. Edentulism has been progressively associated with reduced oral health related quality of life [1]. Treatment of edentulism using removable dentures has extra undesirable consequences that include denture-induced stomatitis, denture-induced residual ridge resorption, and reduced masticatory efficiency (compared with natural teeth). Endosseous dental implants have been used for more than 30 years to retain or support removable dentures or fixed prostheses [2,3]. The use of 4 or more parasymphseal implants to retain and support fixed or removable prostheses is a well- documented procedure that is frequently acknowledged and approved to provide long-term (> 10 year) purpose [4-6]. For many years clinicians recognized that placement of endosseous osseointegrated implants under removable dentures would afford the definitive benefits of bone preservation [7], prosthetic retention, stability, and a degree of occlusal support resulting in improved function, facial esthetics, and comfort [8]. Several studies documented that improved nutrition, psychosocial status, and oral health related quality of life have been seen through the use of implant-retained overdentures (IROs) treatment modality [9,10]. The success rate of dental implants retaining overdentures is among the highest success rates for dental implants. The majority of reports suggest implant survival is greater than 95% after 5 years follow-up [11]. In the maxilla, 4 endosseous implants, anecdotally and based on survival rate studies, are deemed the minimum number required for IROs treatment [12]. While, placement of 2 implants in the mandible and the fabrication of IROs has been considered the most favorable treatment option [13-16]. The most important decision in IROs construction is whether to splint the implants by bar or leaving them unconnected, particularly for edentulous maxilla. Generally, studies have supported the idea of splinting implants for edentulous maxilla during IROs reconstruction [17]. Critical assessment of the available restorative or crown height space (CHS) during the diagnostic stage of implant overdenture treatment is mandatory. Unfortunately, this principal factor is not often assessed due to lack of cooperation between the surgeon and prosthodontist, leading to prostheses fabrication with inadequate restorative space. Several studies reported a minimum of 13-14 mm of vertical space is needed for bar-retained overdentures [18,19] with 10-12 mm horizontal clearance [20] between implants. 10-12 mm is required for individual attachments retained overdentures [18], however other study suggested a minimum of 7 mm vertical space [21] should be available for low-profile individual attachment. One clinical study reported minimum space requirement for IRO

with locator attachments is 8.5 mm of vertical height and 9 mm of horizontal clearance [22]. The purpose of this clinical report is to describe the clinical steps of Maxillary/Mandibular IROs fabrication with individual un-splinted abutments due to limited crown height space vertically, and insufficient horizontal clearance.

Description of the Case

A 55-year-old female was referred to the prosthodontics department in Tehran University of Medical Sciences (TUMS) after dental implants insertion for maxillary/mandibular arches. After clinical and panoramic radiographic examination (Figure 1 and 2), the patient has been received 4 implants for the maxilla (Dentium/Superline, 3.8 mm x 12 mm, internal hexagon, Seoul, South Korea) in the position (# 4,5,11,13), and two implants for the anterior mandible (Dentium /Simple line II, 4.8 mm x 10 mm, internal octagon, Seoul, South Korea) in the position (# 22,27). The surgeon inserted the implants with no prosthodontic consultation, and the positions of implants were not in ideal situation. The clinical decision was to fabricate removable prostheses retained by implants, and tissue-supported for both arches. Primary impressions with irreversible hydrocolloid (Take 1® Alginate, Kerr, Orange, CA, USA) were taken. Customized trays were fabricated and open-tray impression copings were placed, hand tightened, rigidly splinted with pattern resin (Figure 3), and verified with periapical x-ray to confirm the complete seating of the impression copings. After border molding open-tray final impression procedure was made with medium-viscosity monophase A-silicone (Panasil® monophase, Kettenbach, GmbH, Germany) for mandibular arch, and Vinylsiloxanether (VSXE) A-silicon & polyether mixed material (Identium® Medium, Kettenbach, GmbH, Germany) for maxillary arch (Figure 4). In the maxillary arch more rigid material with good elasticity was required to pick-up the four implants, so it was preferred to use a combination of polyether and A-silicone material. The record bases were fabricated, and used for establishing VDO, and recording maxillomandibular centric relation (CR). Using an arbitrary face-bow (Dentatus; Type AEB, Sweden) and CR record, final casts were mounted in a semiadjustable articulator (AB Dentatus; Jakobsadalsvägen, S 12653, Hägersten, Sweden). Denture teeth were arranged on the articulator according to the predetermined VDO. In the next appointment the wax trial dentures were tried-in, facial profile checked, pronunciation tested with all other clinical prerequisites. The crown-height-space (CHS) was measured on the casts with periodontal probe by using the putty-silicon-index to determine the available space, and to define the type of the attachments to be used for both arches. The vertical space (CHS) was about 19 mm between the two arches. Insufficient facio-lingual clearance was found for maxillary arch, because of the buccally inserted implants (Figure 5). Four two-pieces 15° Locator® attachment were picked for the maxillary arch (Zest Anchors, U.S.A), while two one-piece straight Locator® attachment were selected for the mandibular arch (Zest Anchors, U.S.A). Reinforcement metal frameworks were constructed following master cast duplication to prevent the potential fracture of the denture caused by minimal acrylic thickness or excessive occlusal forces. At the delivery procedure the attachments were seated intra-orally (Figure 6), and torqued according to the manufacturer's instructions (20N. cm). The male caps were placed inside the metal housings of the prostheses (Figure 7). The prostheses were inserted in the patient's mouth, and the borders of the prostheses were checked with P.I.P material. The occlusal scheme was bilateral-balanced-occlusion (Figure 8). The success of implants was clinically assessed, and the patient was followed-up for more than 24 months with no complications just recalled for plastic caps replacement (Figure 9).



Figure 1: Panoramic view





Figure 2: Intra-oral (frontal & occlusal) view

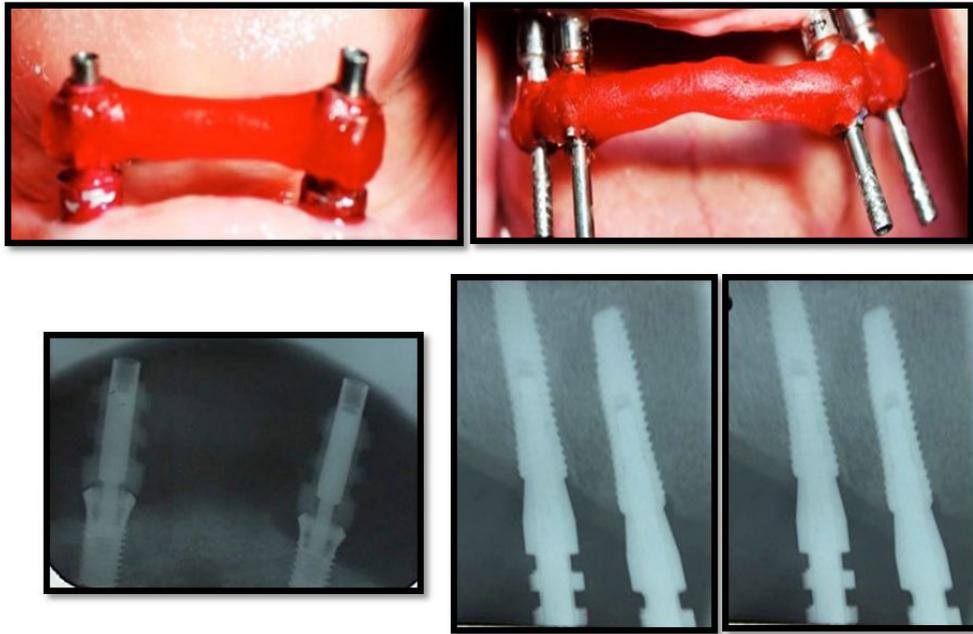


Figure 3: Rigidly splinted impression copings (intra-oral& radiographic)

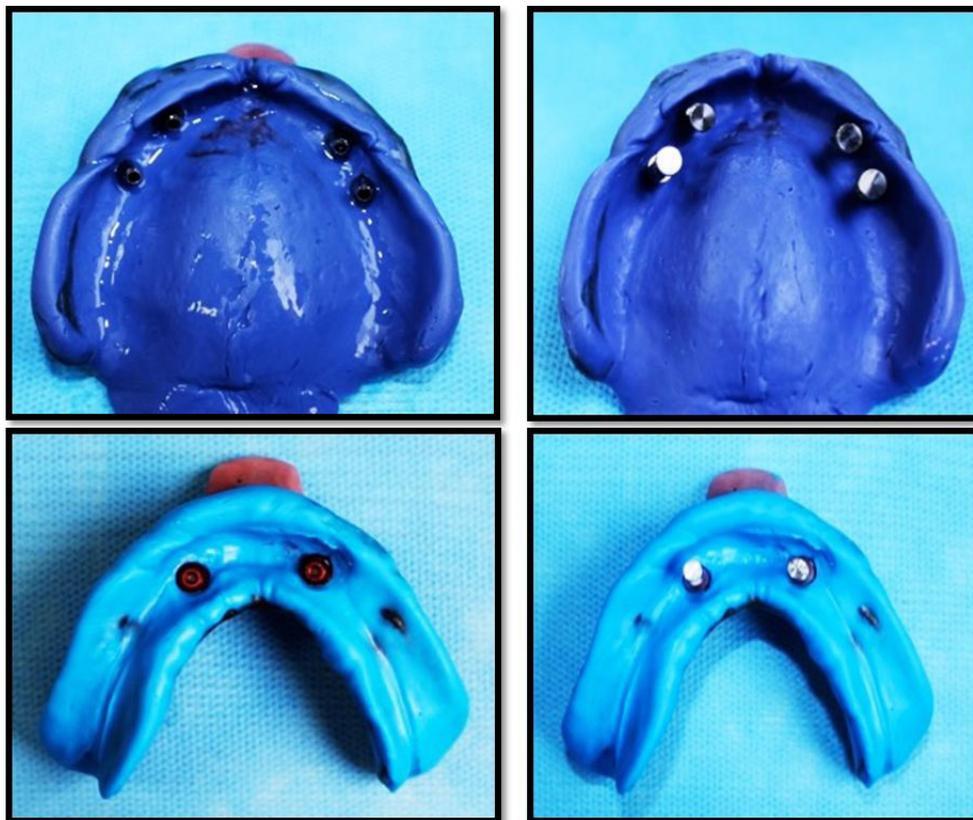


Figure 4: Final impression of both arches

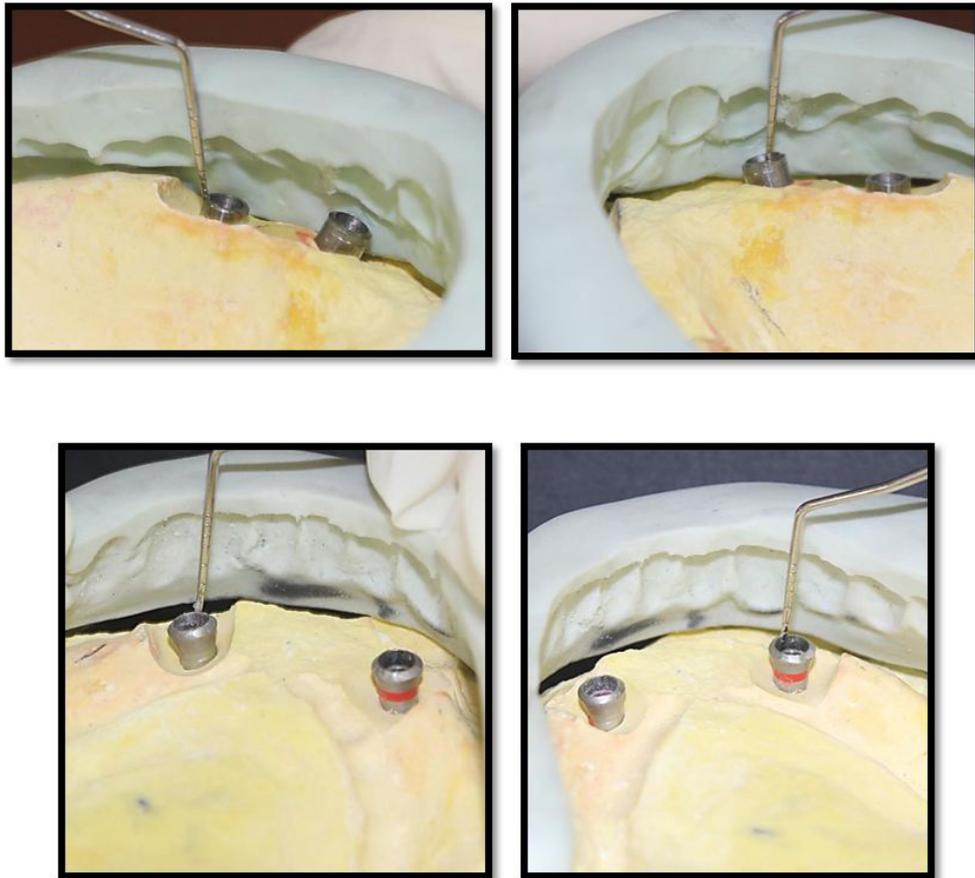


Figure 5: Measurement of the available CHS using putty-silicone-index



Figure 6: Intra-oral Locator attachments insertion



Figure 7: Intaglio surface of dentures after Kerator male caps placement



Figure 8: Intra-oral view after delivery



Figure 9: Smile view (before & after)

Discussion

Treatment outcome with mandibular IRO was found to be predictable, satisfactory treatment modality for elderly patients, and successful in long-term follow-up studies [8,23-25]. IROs have the noticeable advantages of improving the clinical performance of the denture in aspects of support, retention, stability, and enhancing the chewing efficiency [26,27]. When an overdenture is

designed in maxillary arch, the clinicians must first plan for the type of mechanical attachments that are connected to the implants, and needed to secure the prostheses. This prerequisite is essential because the denture must resist the gravity forces. A longitudinal prospective study of 49 patients showed no difference in implant survival rate between patients restored with stud or round-bar attachments. In this study, both mandibular and maxillary overdentures retained by a minimum number of implants (2-5) were included. The survival rates were 100% and 75.4%, respectively [28]. A 5-year prospective randomized study by Gotfredsen and Holm of overdentures retained by 2 implants in the mandible showed a success rate of 100%, which was independent from the attachment system used (ball or bar) [29,30]. The use of bar-clip and other similar components required a distance of about 12 mm from the implant platform to the incisal edges of the incisors [30]. Another critical aspect is the availability of sufficient horizontal space for the structural integrity of the prosthesis, when bar attachment to be used. In this clinical case because of absence of both horizontal and vertical space, the stud attachments were preferred. The vertical space (CHS) was about 19 mm between the two arches. Insufficient facio-lingual clearance was found for maxillary arch, because of the buccally inserted implants. According to the compromised situation, the decision was to exclude the implants connecting choice, and the lone-standing individual abutments were selected to support the maxillary/mandibular removable dentures. Several clinical studies have revealed that there is no significant difference in patient satisfaction either restored by individual stud or bar attaching mechanisms [31,32]. In the ideal situation the clinician must develop a strategy for the location, number of implants required for the prostheses before implant placement. Treatment plan mandates appropriate radiographs, diagnostic casts, casts mounting, was trial dentures, and patient consent of the estimated teeth arrangement. When these data are collected, then a surgical guide can be fabricated to aid the surgeon in positioning the most favorable implants sites. In the present report the surgeon was inserted the implants with no previous prosthodontic consultation, which made the treatment plan more difficult to be accomplished. Therefore the recommendations are critical to follow these phases during the construction of IROs in order to avoid any forthcoming complications, particularly during the stage of mechanical attachments selection. Precise planning of each specific case permits predictable outcome, and simplify the completion of treatment for the clinicians. Through proper patient evaluation, ideal communication among surgeon, prosthodontist, and laboratory colleagues, implant-retained-overdenture will provide simple, predictable, and cost-effective treatment option for edentulous patients. In this clinical report Locator overdenture attachment system was selected because of its ease of insertion and removal, dual retention, low vertical profile, and unique ability to pivot, thus increasing its resiliency and tolerance in divergent implants situation [33].

Conclusion

In this article the clinical steps of fabricating Maxillary/Mandibular IROs with individual Locator overdentures attachments have been presented. Despite the compromised situation with limited CHS and insufficient horizontal space, the final result was acceptable. The patient was completely satisfied.

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