



## An innovative design in a mandibular overdenture with too-lingually-inserted implants: A case report

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### ABSTRACT

Prosthetic rehabilitation of patients with unfavorable-implant-position or problematic implant angulation is complicated. A completely-edentulous-patient with lower lip squamous-cell-carcinoma had undergone resective surgery twice. After radiotherapy of a total dose of 60cGy of 30 sessions for about 3 months, moderate trismus was developed. Mouth commissurotomy was accomplished in order to insert three implants in the mandibular-anterior-region. Two distal implants were excessively tilted to achieve better biomechanical advantages and to obtain greater anterior-posterior-distance which made prosthetic rehabilitation of the patient challenging. In the mandibular-custom-tray a lingual "window" was designed to accommodate the open-impression-copings. Trial-denture-bases were tried-in. A putty index was recorded from arranged-mandibular-teeth. According to this index, a zigzag bar similar to letter "M" was designed using custom abutments. So that three ball anchors were placed on this "M-designed-bar" (MDB) more labial than the inserted implants to support the mandibular-implant-supported-overdenture. Using MDB permits teeth-set-up with minimal interfere with tongue function. The major disadvantage of this design is its inevitable-buccal-cantilever. Distolingual areas of mandibular tray were border-molded excessively in order to overcome this problem and to increase stability and also to reduce detrimental-lateral forces to implants.

**Key words:** Dental Implants, Implant-Supported Denture Prosthesis.

### Introduction

Treatment of patients with severe mandibular atrophy using conventional denture is a challenge for the dentists, because there is not sufficient load bearing capacity [1]. Implant-supported overdenture (ISO) is a successful and effective treatment option. Its advantages are less invasiveness, durability, simplicity, and cost-effectiveness [2]. They also can improve the patient's satisfaction and quality of life and increasing retention and stability of the prosthesis [3,4]. Available studies evaluating ISO by two, three, or four implants demonstrated that implants have a high survival rate. In most studies, survival rate was at least 90% [5,6]. Mericske-Stern (1990) and Engquist et al. (1988) found that there are no differences between implant-supported overdentures involving two, three, or four implants in the interforaminal region

in terms of health of the tissues surrounding the implants [7,8].

There are many different attachment systems which can be used with ISO including studs, bars, magnets, and telescopic crowns [9]. Clinical outcome of different attachment systems was assessed by Naert et al. (1999), and the five-year implants success rate was 100% in all groups [4]. When choosing the appropriate attachment system, potential effect of them on implant survival rate, marginal bone loss, soft tissue complications, retention, stress distribution, space requirements, maintenance complications, and patient satisfaction should be considered [10].

Occasionally, dentist encounter with cases in which implants do not have appropriate position, especially in patients with poor bone quality. It makes the treatment procedure complicated and needs some innovations and using modified methods. There are too many studies in the literature reviewed on use of distal cantilevers especially in fixed-implant-supported-prostheses [11-13]. However, there was not any article on buccal cantilever in implant-supported-overdentures. The aim of this clinical report is to document the prosthetic rehabilitation of a patient with unfavorable-implant-positions.

### Clinical Report

A 65-year-old male patient presented to the Department of Prosthodontics at Tehran University of Medical Sciences. He had undergone resective surgery twice due to lower lip squamous-cell-carcinoma and received radiotherapy of total dose 60cGy of 30 sessions for about 3 months. Thereby resulting in Moderate trismus. Mouth commissurotomy was accomplished in order to insert implants in the mandibular-anterior-region. Three implants (Simpleline II, No. SOFX483812S, 3.8 in diameter, 12 mm in length; Korea) were inserted too lingually in the mandibular-anterior-region. Unfortunately, distal implants were excessively tilted. The aim of the surgeon was to achieve better biomechanical advantages and to obtain greater anterior-posterior-distance (Figure 1). But, the result was not suitable for prosthetic rehabilitation.

Primary impression was taken with irreversible hydrocolloid. Custom trays were fabricated. In the mandibular-custom-tray a lingual "window" was designed to accommodate the open-impression-copings (Figure 2). Both custom trays were border-molded. Distolingual areas of mandibular tray were molded excessively to increase stability and reduce detrimental-lateral-forces to implants. Final impression was made conventionally with zinc-oxide-eugenol (Cavex; Holland BV) in maxillary arch. Trial-record-bases (TDB) with wax-rims were fabricated to establish VDO (vertical dimension in occlusion) and to register CR (centric relation). An arbitrary face-bow (Dentatus; Type AEB, Sweden) was used. Master casts were mounted in a semiadjustable articulator (AB Dentatus; Jakobsadalsvägen, S 12653, Hägersten, Sweden). Artificial teeth were set-up considering patient's neutral zone. TDBs were tried-in. A putty index was recorded from arranged-mandibular-teeth. According to this index, a zigzag bar similar to letter "M" was designed using custom abutments. So that three ball anchors were placed on this "M-de-

signed-bar" (MDB) more labial than the inserted implants to support the overdenture (Figure 2). Using MDB permits teeth-set-up with minimal interfere with tongue function. MDB was inserted in patient's mouth and TDBs were tried-in again to verify patient's CR, lip support, and speech. The processed mandibular overdenture and maxillary complete denture were delivered (Figure 3,4). Oral hygiene was instructed and the patient was educated to use chlorhexidine, toothbrush, and superfloss. Sore spots were detected in the floor of the mouth after 24 hours. The lingual areas of the acrylic above the screws of MDB were selectively grinded. The sore spots were relieved but food impaction in this area was consequently resulted. The patient was advised to remove the overdenture after each meal and rinse it with water. In the first year, the patient was recalled monthly and radiographs were taken every 6 month. The patient was completely satisfied.



Figure 1. Panoramic view after implant insertion.



Figure 2. Lingual window was designed in the mandibular-custom-tray.

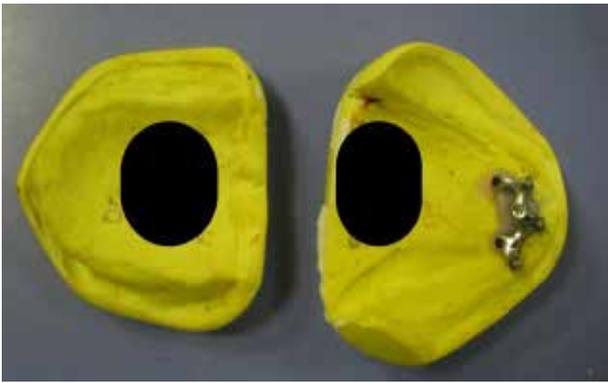


Figure 3. Maxillary and mandibular master casts. Notice to the “M-designed-bar” and three balls placed more labial than it.



Figure 4. Labial balls permit teeth arrangement labial to the ridge without interfering with patient's tongue function.



Figure 5. Delivery of the prostheses.

## Discussion

Improper implant placement can make the prosthetic rehabilitation so complicated. In such condition, ideal and usual treatment procedure may not be used. The excessive-lingually-tilted implant in this case resulted in many problems including violating the tongue space. Also, lack of implants parallelism may affect retentive capacity of the attachment systems [14], so that MDB design was considered. It allowed to set up the teeth more labially to prevent from interfering the tongue function and position the attachments par-

allel to each other and at the same occlusal height to improve retention [15].

Celik et al. (2007) evaluated the stress distribution of different retention mechanisms in overdentures supported by three implant. They designed two models. In one, implants were placed vertically and parallel to each other. In second model, mid implant was placed vertically but the other two implants were tilted distally similar to our patient. They found that the lowest stress was applied to all implants with the ball-bar attachment system in both models [16]. But there is a main difference between our patient and the second model used in this study which was the inevitable-buccal-cantilever in the current study. In order to overcome this problem, the distolingual areas of the mandibular overdenture were overextended. Of course, short cantilevers (less than 5mm) may be considered acceptable [17,18].

## Conclusion

The fabrication of an implant-supported overdenture using a zigzag-designed-bar may be a suitable alternative design for the prosthetic management of a patient with unfavorable-implant-position as described in this report.

## Conflict of Interest

There is no conflict of interest to declare.

## References

- [1] Batenburg RH, Meijer HJ, Raghoobar GM, Vissink A. Treatment concept for mandibular overdentures supported by endosseous implants: a literature review. *Int J Oral Maxillofac Implants.* 1998; 13(4):539-45.
- [2] Barão VAR, Assunção WG, Tabata LF, Delben JA, Gomes ÉA, de Sousa EAC, et al. Finite element analysis to compare complete denture and implant-retained overdentures with different attachment systems. *J Craniofac Surg.* 2009; 20(4):1066-71.
- [3] Naert I, Quirynen M, Theuniers G, van Steenberghe D. Prosthetic aspects of osseointegrated fixtures supporting overdentures. A 4-year report. *The Journal of prosthetic dentistry.* 1991 ;65(5):671-80.
- [4] Naert I, Gizani S, Vuylsteke M, Van Steenberghe D. A 5-year prospective randomized clinical trial on the influence of splinted and unsplinted oral

- implants retaining a mandibular overdenture: prosthetic aspects and patient satisfaction. *J Oral Rehabil.* 1999; 26(3):195-202.
- [5] Hemmings KW, Schmitt A, Zarb GA. Complications and maintenance requirements for fixed prostheses and overdentures in the edentulous mandible: a 5-year report. *Int J Oral Maxillofac Implants.* 1994;9(2).
- [6] Adell R, Eriksson B, Lekholm U, Brånemark P-I, Jemt T. Long-term follow-up study of osseointegrated implants in the treatment of totally edentulous jaws. *Int J Oral Maxillofac Implants.* 1990; 5(4):347-59.
- [7] Merickske-Stern R. Clinical evaluation of overdenture restorations supported by osseointegrated titanium implants: a retrospective study. *Int J Oral Maxillofac Implants.* 1990;5(4).
- [8] Engquist B, Bergendal T, Kallus T, Linden U. A retrospective multicenter evaluation of osseointegrated implants supporting overdentures. *Int J Oral Maxillofac Implants.* 1988;3(2).
- [9] Heckmann SM, Wichmann MG, Winter W, Meyer M, Weber HP. Overdenture attachment selection and the loading of implant and denture-bearing area. Part 2: A methodical study using five types of attachment. *Clin Oral Implants Res.* 2001; 12(6):640-7.
- [10] Trakas T, Michalakis K, Kang K, Hirayama H. Attachment systems for implant retained overdentures: a literature review. *Implant Dent.* 2006; 15(1):24-34.
- [11] Yokoyama S, Wakabayashi N, Shiota M, Ohyama T. The influence of implant location and length on stress distribution for three-unit implant-supported posterior cantilever fixed partial dentures. *The Journal of prosthetic dentistry.* 2004;91(3):234-40.
- [12] Sertgöz A, Güvener S. Finite element analysis of the effect of cantilever and implant length on stress distribution in an implant-supported fixed prosthesis. *The Journal of prosthetic dentistry.* 1996; 76(2):165-9.
- [13] Wennström J, Zurdo J, Karlsson S, Ekstubb A, Gröndahl K, Lindhe J. Bone level change at implant-supported fixed partial dentures with and without cantilever extension after 5 years in function. *J Clin Periodontol.* 2004; 31(12):1077-83.
- [14] White S, Caputo A, Anderkvist T. Effect of cantilever length on stress transfer by implant-supported prostheses. *The Journal of prosthetic dentistry.* 1994; 71(5):493-9.
- [15] Naert I, Quirynen M, Hooghe M, van Steenberghe D. A comparative prospective study of splinted and unsplinted Branemark implants in mandibular overdenture therapy: a preliminary report. *J Prosthet Dent.* 1994; 71(5):486-92.
- [16] Celik G, Uludag B. Photoelastic stress analysis of various retention mechanisms on 3-implant-retained mandibular overdentures. *The Journal of prosthetic dentistry.* 2007; 97(4):229-35.
- [17] Tashkandi EA, Lang BR, Edge MJ. Analysis of strain at selected bone sites of a cantilevered implant-supported prosthesis. *The Journal of prosthetic dentistry.* 1996; 76(2):158-64.
- [18] Sadowsky SJ, Caputo AA. Stress transfer of four mandibular implant overdenture cantilever designs. *The Journal of prosthetic dentistry.* 2004; 92(4):328-36.

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