CASE REPORT

Balanced occlusion aided locator abutment retained overdenture with no implant placed within anterior region: A case report

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1 | INTRODUCTION

Implant-supported denture was a critical strategy for reconstructing dentition defect. The abundant and stable bone quantity around the implant was prerequisite for the long-term survival and functioning of an implant. Alveolar ridge atrophy, which was prevailing at the posterior area among senile patient, greatly restricted the utilization of implant placement, and for such cases, guided bone regeneration and maxillary sinus lift were obligatory for implant sites.

2 | METHODS AND MATERIALS

2.1 | Clinical examination

A 58-year-old, healthy, and nonsmoking female patient was selected with neither cardiovascular diseases nor other systemic diseases. The oral hygiene condition was comparatively good. The patient suffered from a severe collapse in facial form, which resulted in the disappearance of nasolabial sulcus, but the lateral profile appeared normal. Teeth on the upper jaw were extracted 10 years before for severe periodontitis, after which the patient had removable partial denture and complete denture rehabilitation (Figure 1). The edentulous maxillary alveolar ridge had a severe atrophy on both vertical and horizontal direction, residual bone width was very thin on the anterior region of upper jaw, contour of the upper lip was subsided. The patient has an occlusion space of 9.5 mm, and the interarch distance was 18.0 mm. The attached gingiva in maxillary posterior area was appropriate. CBCT scanning indicated that there was insufficient bone quantity at the anterior area of maxillae for implant placement (Figure 2), there were two unerupted retained maxillary canine teeth (Figure 3) and available bone quantity in posterior

Key Clinical Message

A maxillary edentulous arch with severe bone resorption was treated by locator abutment retained overdenture. Under the criterion of balanced occlusion, implants located solely in the posterior area is a good selection which could efficiently guarantee the stability and perdurability of the overdenture in 2-year follow-up.

KEYWORDS

balanced occlusion, dental implant, edentulous maxilla, locator abutment
area was <4 mm at vertical direction and the bone density was relatively normal (Figure 4). Incisors and canines were intact at the mandibular area, only residual roots remaining at the molar region.

2.2 | Therapy plan

The literature about edentulous treatments\(^1\) was retrieved according to evidence-based medicine. The results showed that there were many kinds of methods, among those sinus augmentation could increase bone quantity and keep the stability of the bone around the implants and implant-supported overdenture could restore the missing teeth and the soft tissue profile. Usually, the partial implants were distributed in the anterior area and the partial implants were designed in the premolar area or the posterior area. In this case, the bone in anterior area was very thin, impossible for implant placement. The implants had to be put in the posterior area, which might cause leverage movement of the implant-supported overdenture. Thus balanced occlusion, which could alleviate and prevent this kind of movement, was introduced in this case. Also, the patient was unwilling...
to undergo the larger operation, like zygomatic implant-supported splinting overdenture and could not afford the higher medical expense. So based on above patient’s condition and edentulous treatment solutions, the treatment plan about this case was as follows.

2.2.1 | Maxillary

Bilateral maxillary sinus augmentation and simultaneously two implants placement at each side. Applied locator abutments 6 months later, and finally finished the final restoration with implant and mucosa supported overdenture.

2.2.2 | Mandible

Extracted the residual roots and finished restoration with removable partial denture.

2.3 | Surgical and prosthodontics treatment

After localized anesthesia, mucosa at posterior region was incised and elevated by V-shaped notches on both sides of upper jaw. Elliptic bone windows, approximately 10 mm*5 mm in sizes were drilled with rounded bur at 4 mm overtop the alveolar ridge. Maxillary sinus floor membrane was separated fully with bone walls, two pieces of gelatin sponges were inserted in the elevated sinus cavity to protect the membrane when drilling the implant-placement hole, and for each side, two implants (Straumann Φ 4.1 mm * L 10 mm) were placed in the augmented area (Figures 5-6). Then gelatin sponges were taken out, a compound of 1.0 g Bio-Oss bone substitution and PRF membrane was inserted into each side of the augmented maxillary sinus cavity and
the bone window was covered carefully with Bio-gide membrane (Figure 7). The wound was tightly sutured, the sutures were removed 10 days after surgery, the residual roots on the mandible were extracted 3 months after maxillary surgery and 2 mm healing abutment was installed during the second-stage surgery 6 months after the implant placement (Figure 8).

Healing abutments were replaced by Locator abutments 7 days after second surgery, the titanium alloy mesh casted implant overdenture was finished 15 days later, and the negative modules of locator abutment were relined by autopolymer soft resin. The mandible was rehabilitated with removable partial denture, and the occlusion was adjusted to balanced occlusion (Figures 9-17).

Clinical examination 2 years after final restoration indicated the stability and reliability of implant-supported overdenture, and CBCT scanning revealed that no bone resorption occurred around the bottom of the four implants compared with that at second-stage surgery. A little bone resorption occurred at the palatal neck of 16-implant and 17-implant and no bone resorption at 26-implant and 27-implant at 1-year follow-up (Figure 18) during the first-year follow-up. There is no obvious difference of bone surrounding from CBCT scanning between 1-year follow-up and 2-year follow-up (Figure 19).

3 | RESULT

The bilateral maxillary sinus lift dramatically augmented the available bone quantity, and with the design of balanced occlusion, Locator abutments that solely distributed at the posterior region of alveolar arch would also effectively guarantee the stability and reliability of implant support overdenture. The overdenture demonstrated profound stability and reliability.
The alveolar ridge atrophy on maxillary bone greatly restricted the utilization of implant denture, which always need guided bone regeneration. Techniques as bone splitting, bone condensing, onlay bone grafting and maxillary sinus lifting greatly enhanced the bone quantity as well as availability of implant placement.
Urban indicated that there were no significant differences about bone remodeling around implants of GBR bone and natural bone, the 12-72 months survival was of no differences, which is why posterior implants were supported mainly by GBR bone in this case. Lateral maxillary sinus elevation with the biofilm coverage, greatly enhanced the available bone quantity at the posterior area of maxilla. The biofilm isolated bone from soft tissue, prevented the bone regeneration area from being invaded by fibroblasts. At the same time, PRF compounded with the Bio-Oss substitution contained various growth factors, which would greatly enhance the bone regeneration as well as the angiogenesis process, also isolated the soft tissue from the sharp, mineralized bone substitution, which accelerated and guaranteed the soft tissue healing. In this aspect, both the biofilm coverage and PRF insertion contributed to the success of this case.

Locator abutment, together with its negative modules, was a modified ball-cap retained module. It was not so easy to fracture as ball-cap modules, while for the locator abutment retained overdenture, in order to fulfill the stability of overdenture, the partial implants were always located at the anterior region of an edentulous arch. As far as this case was concerned, the patient was unwilling to undergo the larger operation and could not afford the higher medical expense, and 4-implants located at the posterior area for overdenture stability seemed to be the best solution. Normal complete denture requires the whole palate covered to remain retention, but the quadrangle arranged locator abutments would greatly enhance the retention of the denture, and thus would modify the retention form of the denture. Moreover, the
elastic device of the Locator abutment would not only buffer the stress concentration, but also lower and alleviate the leverage movement of the denture caused by the biting forces, this is also the innovative design this case.

Seldom any cases had tried to put the locator abutments as well as the implants solely in the posterior area, for the instability of overdenture during the chewing process, especially in the protraction process, when no implant retaining in the anterior area, the overdenture would inevitably lever and even dislocation. Balanced occlusion design\textsuperscript{10,11} would be helpful to guarantee the stability of overdenture, as is indicated that balanced dentures would have better retention during eccentric movements than canine-guided dentures,\textsuperscript{12} also it has been reported that compared with nonbalanced occlusion complete denture, denture with balanced occlusion would decrease the alveolar ridge resorption\textsuperscript{13} and also enhance the patient’s satisfaction and made patients better to adapt to the new denture compared with canine-guided dentures.\textsuperscript{14} In this aspect, the balanced occlusion would be better for the long-term survival of patient’s implants. With no implant retaining in the anterior area, the overdenture would inevitably cause leverage movement and even dislocation, but in this case, the balanced occlusion would guarantee the denture’s stability, especially in the mandibular protraction and retraction process, the 1-year and 2-year followed clinical visits revealed the reliability of locator retained overdenture which all the implants were placed in the posterior area. According to the CBCT scanning, bone modification around the palatal neck of 16-implant and 17-implant is later than 26-implant and 27-implant during the first-year follow-up, which may be due to the free-hand operation trauma. And from the 1-year follow-up and 2-year follow-up, there was no bone resorption, which also revealed that no stress concentration was distributed around the implants. But as seldom any cases were reported to have solely all the locator retained implants in the posterior region, the further survival and function of such design still need further clinical experiments and observations. The elastic ring, balance occlusion, and bone resorption should be paid more attention in the following visits.

5 | CONCLUSION

Under the criterion of balanced occlusion; implants located solely in the posterior area of the edentulous area efficiently guaranteed the stability and perdurability of the overdenture.

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AUTHOR CONTRIBUTION

SC and TG: performed the operation and the restoration concerning about this case and were major contributors in writing the manuscript. TZ: took and collected all the pictures.
YZ: designed the work. All authors read and approved the final manuscript and contributed equally to this work.

**CONFLICT OF INTEREST**

None declared.

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**REFERENCES**

1. Aghaloo TL, Misch C, Lin GH, Iacono VJ, Wang HL. Bone augmentation of the edentulous maxilla for implant placement: a systematic review. *Int J Oral Maxillofac Implants*. 2016;31(Suppl):s19-s30.
2. Tiwana PS, Kushner GM, Haug RH. Maxillary sinus augmentation. *Dent Clin North Am*. 2006;50:409-424.
3. Urban IA, Jovanovic SA, Lozada JL. Vertical ridge augmentation using guided bone regeneration (GBR) in three clinical scenarios prior to implant placement: a retrospective study of 35 patients 12 to 72 months after loading. *Int J Oral Maxillofac Implants*. 2009;24:502.
4. Carrao V, Dematteis I. Maxillary sinus bone augmentation techniques. *Oral Maxillofac Surg Clin North Am*. 2015;27:245-253.
5. Danesh-Sani SA, Loomer PM, Wallace SS. A comprehensive clinical review of maxillary sinus floor elevation: anatomy, techniques, biomaterials and complications. *Br J Oral Maxillofac Surg*. 2016;54:724-730.
6. Verma UP, Yadav RK, Dixit M, Gupta A. Platelet-rich fibrin: a paradigm in periodontal therapy - a systematic review. *J Int Soc Prev Community Dent*. 2017;7:227-233.
7. Masuki H, Okudera T, Watanabe T, et al. Growth factor and pro-inflammatory cytokine contents in platelet-rich plasma (PRP), plasma rich in growth factors (PRGF), advanced platelet-rich fibrin (A-PRF), and concentrated growth factors (CGF). *Int J Implant Dent*. 2016;2:19.
8. Elsyad MA, Elhaddad AA, Khirallah AS. Retentive properties of O-ring and locator attachments for implant-retained maxillary overdentures: an in vitro study. *J Prosthodont*. 2016; https://doi.org/10.1111/jopr.12534.
9. Alvarez-Arenal A, Gonzalez-Gonzalez I, delLanos-Lanchares H, Martin-Fernandez E, Brizuela-Velasco A, Ellacuria-Echebarria J. Effect of implant- and occlusal load location on stress distribution in Locator attachments of mandibular overdenture. A finite element study. *J Adv Prosthodont*. 2017;9:371-380.
10. Farias NA, Mestriner JW, Carreiro AF. Masticatory efficiency in denture wearers with bilateral balanced occlusion and canine guidance. *Braz Dent J*. 2010;21:165-169.
11. Kimoto S, Gunji A, Yamakawa A, et al. Prospective clinical trial comparing lingualized occlusion to bilateral balanced occlusion in complete dentures: a pilot study. *Int J Prosthodont*. 2006;19:103-109.
12. Peroz I, Leuenberg A, Haustein I, Lange KP. Comparison between balanced occlusion and canine guidance in complete denture wearers - a clinical, randomized trial. *Quintessence Int*. 2003;34:607-612.
13. Postić SD. Influence of balanced occlusion in complete dentures on the decrease in the reduction of an edentulous ridge. *Vojnosanit Pregl*. 2012;69:1055-1060.
14. Rehmann P, Balkenhol M, Ferger P, Wöstmann B. Influence of the occlusal concept of complete dentures on patient satisfaction in the initial phase after fitting: unilateral balanced occlusion vs canine guidance. *Int J Prosthodont*. 2008;21:60-61.

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