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Small-diameter dental implants: An adjunct for retention, stability, and comfort for the edentulous patient

TO CITE THIS ARTICLE
Scarano A. Small-diameter dental implants: An adjunct for retention, stability, and comfort for the edentulous patient. J Osseointegr 2012;3(4):48-50.

ABSTRACT

Aim Studies have shown that mandibular implant overdentures significantly increase satisfaction and quality of life of edentulous elders. Improved chewing ability appears to have a positive impact on nutritional state.
Materials and methods Forty edentulous subjects received four permucosal mini-implants for overdentures in the inter-foramina region of the mandible. Almost all participants were still satisfied with their overdentures. Participant satisfaction concerning retention and stability of the mandibular overdenture was assessed. A micro invasive technique was adopted, without open flap and performed in one chirurgical step; this technique can be used also in the so-called "high-risk" patients (anticoagulant terapy, diabetes, etc).
Results and conclusion The results suggest that a mandibular overdenture retained by 4 mini-implants may be the best treatment strategy for edentulous people with atrophic ridges. The use of mini-implants is in many cases a good clinical alternative to the use of larger diameter implants, in that they enable to reduce surgical time, bleeding, postoperative discomfort and healing time.

KEY WORDS Immediate loading; Mini implant; Overdenture.

INTRODUCTION

Patients who are edentulous in the lower jaw and have to wear lower denture would usually complain of the poor retention. The retention is directly related to the vertical and torsion forces received, in other words, denture resistance against separation force from its site. Denture stability is believed widely to be related to resistance against other forces like oblique and anterior-posterior forces. The patients satisfaction is directly influenced by the amount of denture retention as it has been shown through several studies (1, 2). The introduction of dental implants has improved the quality of life for edentulous patients. The implant overdenture evolved from the fixed tissue-integrated prosthesis as a treatment alternative for the edentulous patient (3). The implant-supported overdenture may be the treatment of choice when there are unfavorable ridge relations, an inadequate number of implants, poor implant distribution or alignment, a desire for easy removal to provide abutment and/or prosthesis hygiene, or financial limitations that may prevent the use of fixed implant prosthesis (4). It may also be a practical form of treatment for "satisfied" denture wearers who desire additional stability for their prostheses (5). A conventional complete mandibular denture is less favorable than a complete maxillary denture in terms of retention. Maintenance of the 2 attachment types is controversial. Some studies suggest that a bar attachment requires less maintenance (6, 7), whereas others suggest the opposite (8). Additionally, proper hygiene around the bar is more difficult than for individual attachments.
The aim of this study is to describe the procedures for treatment planning of a mandibular overdenture for optimal position of implants, and to emphasize the importance of micro surgery in the elderly patient.

MATERIALS AND METHODS

The main criterion in subject selection was the presence of complete edentulism condition, untreated or previously treated, but with an unsatisfactory perception concerning the denture. In the sample were included only the patients who accepted as treatment solution the overdenture anchored on mini-implants.
After the sample establishment it followed a phase in which patients were informed and a written consent was

obtained. The study was carried out at the Department of Medical, Oral and Biotechnological Science, University of Chieti-Pescara (Pescara, Italy).
Mini-implants (Dental Tech, Misinto, Milano, Italy), with a standard diameter of 2,7 mm, and a length ranging from 10 to 13 mm with collar and O-ring as anchoring system were used in this study. These mini-implant are solid one-piece implants placed in a single-stage procedure using two guiding drills. Patients received either local anesthesia or intravenous sedation with local anesthesia. A Hall drill with a 0,8 mm round bur under copious irrigation was used to initiate 1 mm starter holes. A drill was then used with a standard 1.1 mm diameter titanium drill to initiate a hole through the superior cortical plate. Implants were inserted in tooth positions 32, 34, 42, and 44 using a handheld finger driver followed by a ratchet (Fig. 1-3). Implants were deemed successfully placed when sufficient resistance was met at approximately 30-40 Ncm. Forty consecutive patients received 4 mini-implants each between the mental foramina of the mandible from July 2007, to October, 2011. Questionnaires were sent to all 40 patients with a total of 38 patients responding. Patients received the questionnaire an average of 5 months postoperative. The questionnaires had 4 areas of evaluation: comfort, retention, chewing ability, and speaking ability. The patients ranked each area from 1 to 10, with 1 being poor and 10 being excellent. Patients compared denture wearing satisfaction before and after mini-implants placement.

RESULTS

A total of 38 patients were included in this study. A total of 146 implants remain stable for a 97.4% implant success rate. The category with the greatest improvement is retention. Preoperatively patients rated their retention at 2.2 ±0.42, and postoperatively at 8.6 ±0.27, for a difference of 6.4. Comfort was the next greatest improvement, with a preoperative rating of 3.2 ± 0.63 and a postoperative rating of 9.2 ± 0.45, for a difference of 6. Chewing ability also improved, with a difference of 8.0. In the final category of speaking ability, the preoperative to postoperative difference was 4.2. Patients were satisfied with their retention, comfort, and chewing ability, as the average postoperative satisfaction scores were 8.6, 9.2, and 9.3 respectively. Subjective measures of patient approval with mini-implants show highly statistically significant levels of satisfaction in patient comfort, retention, chewing ability, and speaking ability.

DISCUSSION AND CONCLUSION

The need for correcting the patient's problems with

FIG. 1 Implants were placed in a favorable position for implant-retained overdenture.

FIG. 2 The prosthesis after the O-Rings are placed.

FIG. 3 Postoperative view of mini-implants.

faulty denture is an inevitable consequence of retention failure and residual ridge resorption (9). Several different strategies have been introduced to overcome the problem, one of which is the use of dental implants. Implant prostheses are often used to restore partially or completely edentulous patients, but limited bone height and thickness, may restrict the use of dental implants. Small-diameter implants (i.e. length ≤ 2.7 mm) may be selected in these situations (10).
They have several advantages, as it is possible to reduce the need for sophisticated and expensive surgical procedures, to place small-diameter dentures, reduced bleeding, decreased postoperative discomfort, shortened healing time, placement into narrow ridges, and immediate loading (11). However, the limited surface area of small-diameter implants can be a potential

disadvantage as it has less resistance to occlusal forces. Balkin et al. (12) reported that histologically the bone appeared to be integrated to the surface of the mini-implant immediately loaded at the light microscopic level, and the bone appeared to be relatively mature and healthy. Using mini-implants supported overdenture as a definitive method for treating the edentulous is relatively recent and this is why there are not so many articles on the topic. This therapeutic alternative is seen by a large group of authors as indicated especially for the mandibular complete edentulism (13, 14).

Mini-implant supported overdenture can be in complete edentulous patients a treatment alternative to both conventional dentures and conventional implant retained overdenture (15, 16). The advantages of this type of treatment derives from the characteristics of this type of implant (small diameter, variable length, O-ring retention system), which adapts better to the particular morphological conditions present in full edentulous patients (17).

Also, the implants insertion requires less surgical trauma, this being a beneficial aspect in the context of usually poor general status. This type of treatment has a lower cost compared to conventional implant supported overdenture, by the lower cost of mini-implants, and also due to the use, in general, just of the panoramic radiography as imagistic method (computed tomography is an adjuvant method, but not essential in most cases). Also by eliminating some surgical intervention, we eliminate also their costs. Surgical technique may be performed without incision of the soft tissue. The last one is preferred when possible, due to the smaller surgical trauma. This may represent an important benefit of this technique, if we consider the usually poor general status of these patients. On the other hand, the benefits related to an improved stability, better functionality and adaptation are quickly noticed by the patient and increases their level of satisfaction. In conclusion, small-diameter implants can be a solution in cases of limited bone thickness or in elderly patients.

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