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Upper and Lower Overdentures on Implants Case Report

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ABSTRACT: Edentulism significantly reduces maxillary and mandibular bone volume through alveolar bone resorption. This condition also negatively affects mastication, pronunciation, aesthetics, and overall quality of life. This report presents the case of a 65-year-old man who visited the dental clinic in January 2025 for rehabilitation of the edentulous maxillary and mandibular area using implant-supported overdentures. Implant placement was planned in the maxilla at positions 15, 13, 23, and 25, and in the mandible at positions 33 and 43. A delayed placement of the removable prosthesis on the implants was considered. In the reported clinical case, we highlight: A) Implants with a length of no less than 10 mm, except for one 8 mm long implant, which we compensated for with a thickness of 4.5 mm in diameter. B) Placement of implants in positions 15, 13, 23, 25, 33, and 43 to improve load distribution. C) Delayed loading period of 5 months to promote osseointegration (longer than recommended by other authors). D) Use of a bar with distal extensions, employing retention with Vario soft 3 attachments and Akerman clasps, to improve the stability of the overdentures.

KEYWORDS: Dental implants, dental prosthesis, edentulous maxilla, edentulous mandible, implant overdenture, implant-supported overdenture.

I. INTRODUCTION

Edentulism significantly reduces maxillary and mandibular bone volume through alveolar bone resorption [1,2]. This condition also negatively affects mastication, pronunciation, aesthetics, and overall quality of life [3]. The greatest challenges occur with mandibular prostheses, where instability and poor retention often cause difficulties in chewing hard foods, pain, and food impaction [3]. Compared to conventional dentures, implant-retained complete dentures provide superior retention, easier use, and good aesthetics [4].

The success of implant placement depends on biocompatibility, patient factors, implant design, material, tissue health, bone quality and quantity, and procedural aspects such as insertion torque, healing time, biomechanical load, loading moment, and prosthetic design [5,6]. The position, number, and bone volume of the implants, as well as their parallelism, are factors that influence the success of both the implants and the overdenture [7,8]. Placing two dental implants to support a mandibular overdenture increases stability and retention, thus improving masticatory capacity and bite force [9]. The implant survival rate is greater than 90% for mandibular overdentures with two implants [10]. The use of two or four implants for an overdenture has been shown to have no significant differences in peri-implant status [11]. The survival rate for two and four implants was 100% and 97.8%, respectively, with mean peri-implant bone loss of 0.53 mm and 0.40 mm [12], and annual bone loss of $\leq$0.15 mm in the vast majority of cases [13]. The 10-year survival rate for four implants and a bar-supported overdenture was 94.4% [14]. Implant survival was lower in the maxilla than in the mandible [15].

Placement protocols and peri-implantitis outcomes differ for two- and four-implant groups. In the two-implant group, implants were placed in the canine region of the mandible, approximately 1 cm from the midline on both sides [12]. For maxillary overdentures, four splinted implants are recommended in positions 16, 13, 23, and 26 [16], though occasionally positions 13, 11, 21, and 23 are used [17]. In the four-implant group, peri-implantitis incidence was 8.3% after 5 years and 10.5% after 10 years [17].

The attachment system played a significant role in the success of implant-supported overdentures. It is essential that the abutments absorb the force [3]. Breakage of the attachment components connecting the bar and the overdenture was the most common complication [18]. Failure was more frequent in maxillary than in mandibular restorations [19], with fracture rates three times higher for maxillary implant-supported prostheses than for mandibular ones [20]. Attachments vary in shape and include ball, bar, magnet, and locator attachments [21]. According to various authors, ball and locator attachment systems are the best overdenture systems due to their excellent tissue

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response, survival rate, and patient satisfaction [21]. Non-splinted implants retaining mandibular overdentures are associated with greater bone loss than splinted implants (bar attachment) [22]. This is because the splinted bar distributes the load better and reduces implant micromovement and crestal bone loss [21]. However, some authors point out that maintaining hygiene under the bars is difficult, which can lead to mucosal inflammation or gingival hyperplasia [22-24]. Ball attachments appear to have the best peri-implant tissue health compared to other attachments [25,26]. The effect of bar, ball, locator, resilient telescopic, and magnetic attachment systems on peri-implant tissue health has been studied, and all attachment systems were found to have the same effect on marginal bone loss and probing depth [27]. Overdenture attachments exhibit very high survival rates: 96–97% for bar attachments, 96–100% for ball attachments, 90–92% for magnets, and 97% for locators, with a mean follow-up period of 3 years [23]. Locators offer good retention and stability and facilitate hygienic maintenance, but require periodic replacement of the nylon male component [28-30].

The following is a clinical case of a completely edentulous patient who was rehabilitated with a maxillary overdenture retained on four implants splinted with two bars, and a mandibular overdenture retained on two implants splinted with one bar.

II. CASE REPORT

A This report presents the case of a 65-year-old man who visited the dental clinic in January 2025 for rehabilitation of the edentulous maxillary and mandibular area using implant-supported overdentures. For this reason, an orthopantomogram was requested (Fig. 1).

Figure 1. Orthopantomography before treatment.

The patient's previous medical history included silicosis, ulcerative colitis, and aortic valve surgery. Implant placement was planned in the maxilla at positions 15, 13, 23, and 25, and in the mandible at positions 33 and 43. A delayed placement of the removable prosthesis on the implants was considered. The diagnosis was completed by taking several periapical radiographs of the area from different angles, using 4 mm diameter metal spheres as a reference (Fig. 2).

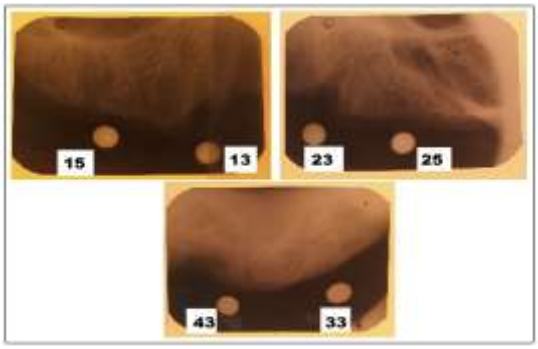

Figure 2. Periapical radiographs with 4 mm reference metal balls.

A superior and inferior dental model was also created and cast in plaster. Days before surgery, the patient was given a complete explanation of the procedure (orally and in writing), written informed consent was obtained, and the cardiologist's recommended medication was prescribed as a preventative measure (3 g of amoxicillin the day before, 1 g of amoxicillin immediately before implant placement, and 1 g of amoxicillin afterward, plus 575 mg of metamizole if discomfort arose, but no anti-inflammatories due to the patient's ulcerative colitis).

On the day of surgery, a simple opening flap was raised in the mandible, and burs were used sequentially until two Galimplant IPX implants (Sarria, Spain), 4 x 12 mm, were placed in positions 33 and 43. Proper bone preparation was performed in terms of width and depth, achieving good primary stability. The incision was closed with 4/0 non-absorbable silk sutures.

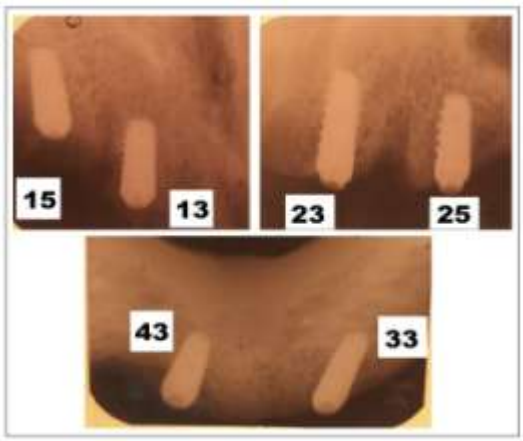

Figure 3. Periapical radiographs with the implants in their positions.

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The implants in the upper jaw were placed 20 days later using a single-opening flap. Sequential drilling was performed until four Galimplant IPX implants (Sarria, Spain) were placed in positions 15 (4.5 x 10), 13 (4.5 x 10), 23 (4.5 x 10), and 25 (4.5 x 8). Proper bone preparation in width and depth was also performed, achieving good primary stability. The incisions were closed using 4/0 non-absorbable silk sutures (Fig. 3).

Following the surgeries, the patient experienced mild discomfort and swelling. At a subsequent check-up, the patient was found to be doing well. Five months later, transepithelial abutments were placed on each implant (2 mm high rotational aesthetic straight multiposition, Galimplant, Sarria, Spain) (Fig. 4). One week later, impression abutments were placed on the implants (Fig. 5) and joined with dental floss and nano-hybrid composite flow (Dent4You AG, Switzerland) to create a more accurate impression (Fig. 6).

Figure 4. Placement of transepithelial abutments on each implant.

To verify the aesthetics and occlusion, a preliminary prosthesis was fabricated using wax models of the teeth (Fig. 7). The fit of the bar framework of the final prosthesis in the mouth was good (Fig. 8). Figure 9 shows the two completed removable overdentures along with their plaster models. It can be seen that the bars have lateral extensions for Vario Soft 3 attachments (Bredent, Germany) and also Ackerman clasps (Indensa, Spain). Figure 10 shows both completed overdentures in the mouth.

Figure 5. Placement of impression abutments on implants.

Figure 6. Union of impression abutments with dental floss and flowable composite.

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Figure 7. Waxed teeth to determine esthetics and occlusion.

Figure 8. Bar structures in the maxilla and mandible.

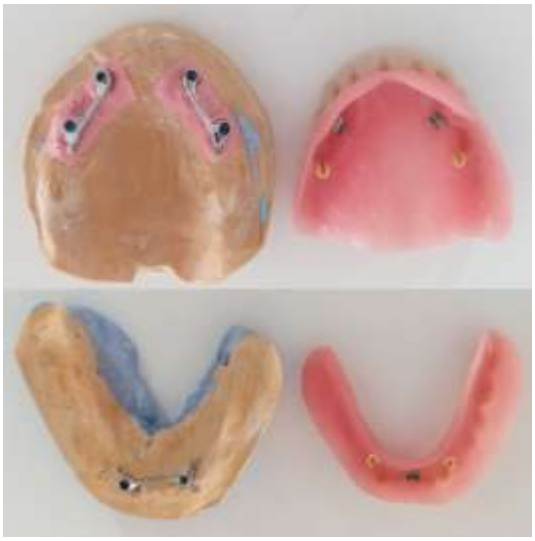

Figure 9. Removable prostheses, overdentures, along with their plaster models with bars.

Figure 10. Removable prostheses, overdentures in the mouth.

DISCUSSION

It is conventionally preferred to keep implants load-free during the healing period to improve osseointegration. Immediate (within 1 week), early (between 1 week and 2 months), and conventional (after 2 months) loading of osseointegrated implants are possible [31,32]. Data suggest that implants loaded immediately fail more frequently than those loaded conventionally [31,32], considering that all failures usually occur within the first 12 weeks [33]. Numerous authors prefer a 3-month osseointegration period and then uncover the implants to place the healing abutments [9,16,17,34]. In some cases, only eight weeks were allowed before performing this second stage of surgery [12]. In our clinical case, we waited five months to ensure proper osseointegration before loading the implants. This yielded an optimal result with 100% success. Several studies have observed increased failure rates when implants were smaller than 10 mm [35]. In our case, we had to place an 8 mm long implant in position 25 to avoid proximity to the maxillary sinus, but we compensated for this by using a 4.5 mm diameter implant.

When evaluating maxillary overdenture treatment with bar-supported implants, with four or six implants after a 5-year observation period [17], and also after 10 years [16,34], no significant differences were found between the two groups. The idea that six implants provide more stability than four implants and result in greater patient satisfaction proved to be false [17]. Studies evaluating maxillary overdenture treatment with prostheses supported by four or six splinted implants show similar results, both biological and functional [13,14]. In our clinical case, we planned from the outset to place four maxillary implants, which is the minimum recommended by previous authors [36]. The placement of these four implants at the crestal bone level has been performed in

positions 13, 11, 21, and 23 [17] and also in positions 16, 13, 23, and 26 [16]. In our case, we preferred positions 13, 15, 23, and 25 due to bone availability, their more posterior location, and to avoid hinge movement. On the other hand, there is debate regarding the optimal placement of the two implants in the mandible. It has been described that overdentures with implants in the canine region exhibited the greatest stress on the peri-implant bone and abutments, as well as greater rotational movement [3,12]. Some studies suggest that placing implants in the lateral incisor region, rather than the canine region, could minimize hinge movement [37] and offer greater stability [3]. However, others question this connection [38]. In our case, we placed mandibular implants in positions 33 and 43, thinking that a milled bar with distal extensions would provide good prosthetic stability.

In the prosthetic phase, previous authors fabricated a bar-clip attachment system to retain the mandibular overdenture [9,12]. Sometimes this consists of a milled bar with distal extensions, screwed onto the abutments, and an overdenture with retentive clips attached to it [39]. In our clinical case, these distal extensions of the bar limit the rotation of the overdenture and provide stability. The drawback, according to some authors, is its tendency to fracture [12]. Another disadvantage of the bar was the higher incidence of prosthetic failures [40], but if other retainers, such as the locator, are used, they also have a high maintenance frequency associated with the components of the attachment [41]. No attachment is without drawbacks. The choice of bars in our clinical case also depends on our previous clinical experience, which favors this type of attachment.

IV. CONCLUSION

In the reported clinical case, we highlight:

- Implants with a length of no less than 10 mm, except for one 8 mm long implant, which we compensated for with a thickness of 4.5 mm in diameter.
- Placement of implants in positions 15, 13, 23, 25, 33, and 43 to improve load distribution.
- Delayed loading period of 5 months to promote osseointegration (longer than recommended by other authors).
- Use of a bar with distal extensions, employing retention with Vario soft 3 attachments and Akerman clasps, to improve the stability of the overdentures.

Conflict of interest: The author reported no conflicts of interest related to this study.

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