

## Implant overdenture and Locator system in edentulous patient with severely resorbed mandible – a case report

CAMELIA IONESCU<sup>1)</sup>, BOGDAN MIHAI GĂLBINAȘU<sup>1)</sup>, HORIA MANOLEA<sup>2)</sup>, ION PĂTRAȘCU<sup>1)</sup>

<sup>1)</sup>Faculty of Dentistry, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

<sup>2)</sup>Faculty of Dentistry, University of Medicine and Pharmacy of Craiova, Romania

### Abstract

Clinical studies have revealed that the main objective of implants in the edentulous jaw is to provide support for fixed prostheses or to stabilize complete dentures. Various attachment systems were developed for universal use in partially and completely edentulous patients such as clasps, cone-shape telescope copings, magnets, bar systems, locators. The aim of this case report is to present the Locator attachment that does not use the splinting of implants. Four implants were placed in the foraminal region and the Locator attachment system was used to connect overdentures to mandibular dental implants. The results proved that the Locator attachment system offers the possibility to obtain a higher retention and an improved stability for overdentures in edentulous patients with a severely resorbed mandible and lack of vertical space between the arches.

**Keywords:** implant, mandibular overdenture, Locator attachment system.

### Introduction

At present, total edentulism is considered a condition that consists of severe dysfunction of the whole dento-maxillary system, and serious comorbidities involving the entire body. It is in no instance considered a privilege of the involution associated with senescence. Primarily, we consider that chronological age does not correspond with the biological age anymore.

During the first three years after teeth extraction, the alveolar bone level decreases considerably, afterwards this process slows a bit, but it will never stop completely. The average rate of mandibular ridge resorption, in such situations, is about 0.2 mm per year [1]. In some cases, the mandibular alveolar ridge resorption is so severe that it is almost impossible to make complete denture that meet all prosthetic requirements.

The literature states that, before the advent of oral implantology, patients with increased resorption of the alveolar ridges were treated by different preprosthetic techniques (soft tissue surgery, ridge augmentation procedures) in order to solve some of such problems; however, very often, these treatments did not provide a permanent solution [2–4].

In recent decades, with the development of dental implants, total edentulous ridges can be restored in various ways. If you insert a sufficient number of dental implants and the space between the two ridges (maxillary and mandibular) is favorable both in vertical and horizontal direction, a fixed denture can be successfully inserted. Another option is a dental implant overdenture.

Both treatment solutions vary in terms of aesthetics and hygiene rehabilitation and not least costs. An overdenture on implants is less expensive than fixed dental prosthesis supported on implants, which is a more attractive treatment solution to a large number of patients.

### Patient, Methods and Results

Patient N.M., aged 53 years, came to the dental office complaining lack of mandibular denture stability and inability to properly masticate. The patient was explained that he required a complex oral rehabilitation, and was offered to choose between different treatment plans. Eventually, the patient has expressed a desire that the dental treatment should begin with the mandibular arch and later on the rehabilitation should include the other arch also, this for financial reasons.

At clinical examination, we found a metal-acrylic fixed prosthesis on the maxillary arch, improperly executed, and on the mandible a conventional denture that was highly unstable (Figures 1 and 2).

Aesthetic examination reveals the need for complex oral rehabilitation: the restoration of the vertical dimension of occlusion, occlusion compensation curves and buccal and incisal curves.

Due to favorable prosthetic field in the front and severe resorption in the lateral region, we chose to insert four dental implants in the interforaminal region and attached an overdenture using the Locator attachment system. The treatment plan was explained to the patient, he was informed of the benefit of a mandibular overdenture on four implants, and informed consent was obtained thereof as he agreed with the proposed prosthetic solution.

Following both clinical-surgical measurements and radiographic examination (panoramic Rx) of mandibular interforaminal area and study models, we found that there is sufficient data to choose the place of insertion of dental implants. In this way, CT was not performed as the patient has had such an investigation done in the last three months.

Four implants were inserted (Dual-Fit Implant, Bio APHA, APHA-Bio Tec Ltd., Israel) with dimensions of

3.3×11.5, 3.3×11.5, 3.3×10, and 3.75×11.5 mm from the forth quadrant to the third (right to left).

Postoperatively, the patient was prescribed antibiotics for five days (Amoxicillin and Clavulanate Potassium), he received strict instructions on oral hygiene (mouth rinsing with Listerine mouthwash for 14 days).

All implants had primary stability at 30 Ncm force, tested in the surgical stage that went on in normal conditions. Healing abutments had been mounted and the suture wires were suppressed 10 days after the intervention (5/0 polypropylene monofilament) (Figure 3).

The mandibular conventional denture was refurbished in accordance with the healing abutments using a relining material based on acrylic resin (GC Tissue Conditioner, GC America Inc., Alsip, IL, USA).

After three months' healing period, which represented the optimal osseointegration of dental implants, we took an impression of the prosthetic field using an open individual tray, removable transfer abutments and an elastic

polyester material (Impregum F, 3M ESPE, MN, USA).

For an exact transfer of intermaxillary relations of occlusion, we used a total facial arch and an adaptable articulator (Artex, Amann Girrbach, Austria) (Figure 4).

A model for the mandibular prosthesis together with a wax-up of the upper arch were made in the dental laboratory and then tried in the oral cavity (Figures 5 and 6).

We analyzed the aesthetics and functionality of the model and sent it back to the laboratory for transforming it into the final prosthetic restoration.

We finally analyzed the retention of Teflon gaskets in accordance with the insertion axis of dental implants and we chose light and ultra light gaskets for the first eight months of wearing. Afterwards, these Teflon gaskets will be replaced with new ones (Figure 7).

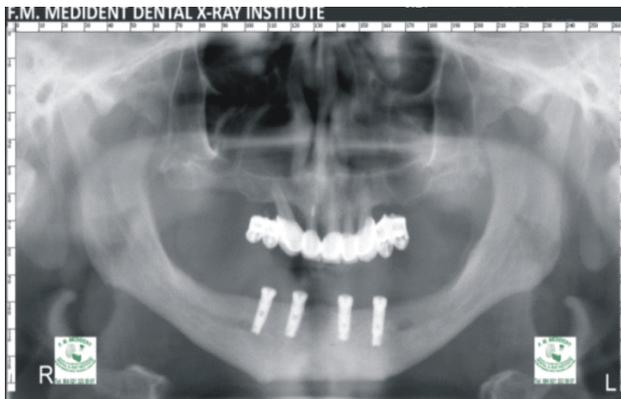
Prosthetic restoration was inserted in the mouth after we previously made a mock-up maxillary restoration accordingly to the wax-up (Figure 8).



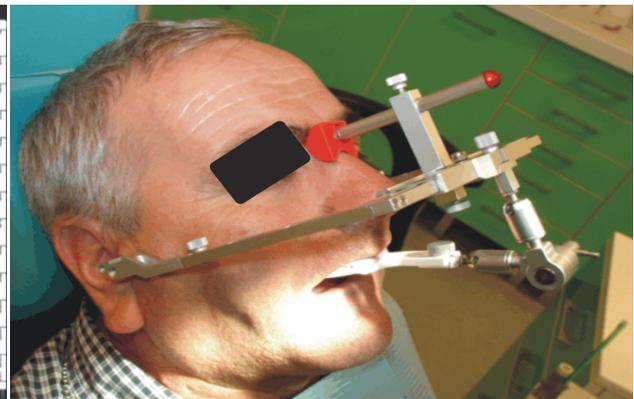
**Figure 1 – Patient's dental and periodontal status at presentation.**



**Figure 2 – Appearance of the dysfunctional mandibular denture.**



**Figure 3 – Radiological appearance of the prosthetic field after insertion of dental implants and their osseous integration.**



**Figure 4 – Establishing the I.M.R. using the facial arc for transferring the terminal hinge axis.**



**Figure 5 – Lower denture model and wax-up done for the upper arch.**



**Figure 6 – Final prosthetic restoration.**



**Figure 7 – Final prosthetic restoration: mucosal surface appearance.**



**Figure 8 – Intra-oral view: special attachment devices were mounted to the implants.**

At the end of treatment, the patient was pleased with the appearance and comfort achieved by the new mandibular denture on the four individual implants and the Locator system.

## Discussion

A final treatment plan include the number and size of dental implants, their topography, type of superstructure and off course financial costs.

Dentists and dental laboratories develop their own practices, using different attachment techniques, based on their individual experience and success and costs variability. When choosing the type of denture attachment, one must take into account the following criteria [5]: the degree of retention available (solidity of implants), adequate restorative space, oral hygiene status, profile height of the device, possibility of reinforcement of the structure, easy application and maintenance and costs.

Many factors contribute to promote the use of individual implants such as: lower costs, improved access for hygiene and cases with small interarch space [6]. Thus, an individual approach, *i.e.*, individual dental implants treatment is more efficient, resulting in the lowest cost and more effective for most edentulous patients [6].

There are some attachment devices that improve denture retention to implants (rods, hooks, magnets, Locator, telescopes). Studies have shown that all attachment systems are effective and that one should use a clinical guide in order to select between these.

Literature divides connecting systems in rigid or resilient. The rigid ones allow limited torque and improve the angled insertion, while the resilient devices permit various rotation and angulation [6]. Where there are slightly non-parallel implants, a resilient device will decrease the friction, wear and fracture [6].

In cases of major complications with overdentures, including the failure of the prosthesis, it is necessary to adjust or replace the connecting device [7, 8]. This situation can be significantly minimized by appropriate selection of the device in question.

A resilient connection between the prosthesis and implant can reduce the load as far as the degree of movement is achieved at the expense of resilience of the mucosa only. In this way, the greatest part of the occlusal force is thus absorbed directly by the alveolar ridge [9].

Adequate restorative space is another important aspect in the success of overdentures therapy [10]. In totally edentulous patients, available restorative space is limited by the occlusal plane, oral soft tissues, facial tissues (cheeks and lips), and tongue. For patients with mandibular dentures, this space should accommodate a large enough base of the prosthesis, proper positioning of the teeth and implant attachment system. Also, factors such as minimal space for speech and aesthetics must be taken into account when defining the available restorative space. Therefore, during the diagnostic phase of overdenture therapy, evaluation of available restorative space is critical [11].

Unfortunately, this important factor is often evaluated for the first time after placing the prosthetic implants

and at that moment alternatives are limited [12]. Attempts to fabricate prostheses in cases with inadequate space can lead to insufficient physiological retention and/or suboptimal stability [10]. To prevent this phenomenon, some authors highlighted the importance of vertical restorative space and its management in patients with overdentures [13]. In this respect, there is a classification system for ridges [13] namely: arch type Class I – restorative vertical space equal to or greater than 15 mm; arch type Class II – space between 12 and 14 mm, arch type Class III – space between 9 and 11 mm, arch type Class IV – space less than 9 mm. Note that, in the latter case it is “necessary to review procedures to increase the vertical space available such as alveoloplastia, intentionally increasing the vertical dimension of occlusion (sizing) and the management of attachment systems in overdentures” [13]. “When the space between arcades is inadequate there are some problems such as: overcontouring dentures, excessive growth of vertical dimension of occlusion, fracture of adjacent teeth, loosening of the overdenture, denture fracture and general patient dissatisfaction” [14].

Other authors consider that “restoring the edentulous arch requires a certain amount of vertical dimension between the maxilla and mandible to ensure adequate thickness of restorative material, space for attachment elements, aesthetics and ease of cleaning” [15].

According to the literature, it appears that “interarch space required for the retention of a prosthesis to the implant (distance from the shoulder of the implant to the incisal edge) is about 12 to 14 mm as follows: a thickness of 2–3 mm of soft tissue is generally present above the implant, an area of 2 mm from the lining of the edentulous ridge to the bar needs to be present for suitable cleaning [15], 4.5 mm bar thickness, 2 mm for the acrylic resin and the rider [16] and 3 mm for the teeth” [17]. Most attachment systems with staples include height of the matrix and the abutment, ranging between 5–6 mm [18].

In conclusion, patients with well-preserved ridge, who have lost teeth due to caries benefit from reduced interarch space for an implant overdenture. In addition to this, the space often limited interferes with the reinforcement of the prosthesis making it hard for the dentist to use the space required for devices such as staple systems [18]. “Thinning the soft tissue during the surgical act and the use of internal connection to implants can help us overcome the problem of limited vertical space” [17].

Due to limited inter-ridge space, one must use low profile systems that can cause thinning of denture base with at least 2 mm. In this regard, since 2001, a new product has been released to the market: the Locator, a new resilient connector whose abutment and attachment system’s height is only 3.17 mm. The system can be applied in a limited inter-ridge space [18], and is a reliable alternative to the staples [19]. It consists of a metal matrix and a resilient plastic element that is placed on latch embedded directly into the prosthesis [18]. The system includes four different colored lining that gives multiple attachment forces. In this way, the patient is pleased with the aesthetic result obtained, and in addition, the system achieves greater retention and greater stability for the prosthesis.

Besides the Locator system, there are other attachment systems with a low profile that can be used with mandibular overdentures. For instance, the magnet attachment systems are also used in patients with low interarch space and important aesthetic requirements [20].

In our case, we chose this kind of treatment because of insufficient restorative space available, which was less than 9 mm. At the same time, we considered the fact that in time it is possible to lose an implant or two, a condition that can be remedied without much need of the laboratory help with refurbishing the denture, accordingly to McGill's consensus. Also, there were financial agreements with the patient that lead to this treatment plan.

Among other factors that guide the selection of attachment devices, we include their height, which significantly contribute to reducing the potential of fracture of the denture base in the case of insufficient acrylate thickness.

The advantage of using the Locator attachment system is that when a gasket replacement is needed it is not mandatory to remediate the entire device within the denture base.

## ☒ Conclusions

The development of oral implantology has lead to a great improvement of the oral rehabilitation of edentulous thus improving the quality of life in these patients. Implant-supported overdenture therapy can provide stability, support and retention of the prostheses in edentulous patients with severely resorbed mandible. Using the Locator attachment system, mandibular implant-supported overdentures are a true alternative to fixed prostheses in terms of economics, saving time as well.

## Acknowledgments

This case report is a part of the PhD Thesis of the first author who fulfilled requirements for the PhD degree in Medical Sciences at "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania.

## References

- [1] Tallgren A, *The continuing reduction of the residual alveolar ridges in complete denture wearers: a mixed-longitudinal study covering 25 years*, J Prosthet Dent, 1972, 27(2):120–132.
- [2] van Waas MA, Kalk W, Engels SE, *Patients with atrophic mandibles: opinions regarding the benefit of preprosthetic surgery*, Int J Prosthodont, 1992, 5(6):527–532.
- [3] Mercier P, Huang H, Cholewa J, Djokovic S, *A comparative study of the efficacy and morbidity of five techniques for ridge augmentation of the mandible*, J Oral Maxillofac Surg, 1992, 50(3):210–217.
- [4] Stoelinga PJ, Blijdorp PA, Ross RR, De Koomen HA, Huybers TJ, *Augmentation of the atrophic mandible with interposed bone grafts and particulate hydroxylapatite*, J Oral Maxillofac Surg, 1986, 44(5):353–360.
- [5] Strong SM, *Conversion from bar-retained to attachment-retained implant overdenture: case report*, Dent Today, 2006, 25(1):66, 68–70.
- [6] Vogel RC, *Implant overdentures: a new standard of care for edentulous patients current concepts and technique*, Compend Contin Educ Dent, 2008, 29(5):270–276; quiz 277–278.
- [7] Watson GK, Payne AG, Purton DG, Thomson WM, *Mandibular overdentures: comparative evaluation of prosthodontic maintenance of three different implant systems during the first year of service*, Int J Prosthodont, 2002, 15(3):259–266.
- [8] Ochiai KT, Williams BH, Hojo S, Nishimura R, Caputo AA, *Photoelastic analysis of the effect of palatal support on various implant-supported designs*, J Prosthet Dent, 2004, 91(5):421–427.
- [9] Besimo C, *Removable partial dentures on osseointegrated implants: principles of treatment planning and prosthetic rehabilitation in edentulous mandible*, Quintessence Publishing Co., Chicago, IL, 1998.
- [10] Chaimattayompol N, Arbree NS, *Assessing the space limitation inside a complete denture for implant attachments*, J Prosthet Dent, 2003, 89(1):82–85.
- [11] AbuJamra NF, Stavridakis MM, Miller RB, *Evaluation of interarch space for implant restorations in edentulous patients: a laboratory technique*, J Prosthodont, 2000, 9(2):102–105.
- [12] Ahuja S, Cagna DR, *Defining available restorative space for implant overdentures*, J Prosthet Dent, 2010, 104(2):133–136.
- [13] Ahuja S, Cagna DR, *Classification and management of restorative space in edentulous implant overdenture patients*, J Prosthet Dent, 2011, 105(5):332–337.
- [14] Lee CK, Agar JR, *Surgical and prosthetic planning for a two-implant-retained mandibular overdenture: a clinical report*, J Prosthet Dent, 2006, 95(2):102–105.
- [15] Misch CE, *Treatment options for mandibular implant overdenture: an organized approach*. In: Misch CE, *Contemporary implant dentistry*, 2<sup>nd</sup> edition, Mosby, St. Louis, 1998, 175–192.
- [16] Morris JC, Khan Z, von Fraunhofer JA, *Palatal shape and the flexural strength of maxillary denture bases*, J Prosthet Dent, 1985, 53(5):670–673.
- [17] Phillips K, Wong KM, *Space requirements for implant-retained bar-and-clip overdentures*, Compend Contin Educ Dent, 2001, 22(6):516–518, 520, 522.
- [18] Pasciuta M, Grossmann Y, Finger IM, *A prosthetic solution to restoring the edentulous mandible with limited interarch space using an implant-tissue-supported overdenture: a clinical report*, J Prosthet Dent, 2005, 93(2):116–120.
- [19] Alsiyabi AS, Felton DA, Cooper LF, *The role of abutment-attachment selection in resolving inadequate interarch distance: a clinical report*, J Prosthodont, 2005, 14(3):184–190.
- [20] Ceruti P, Bryant SR, Lee JH, MacEntee MI, *Magnet-retained implant-supported overdentures: review and 1-year clinical report*, Can Dent Assoc, 2010, 76:a52.

## Corresponding author

Bogdan Mihai Gălbinașu, Assistant, MD, PhD, Faculty of Dentistry, "Carol Davila" University of Medicine and Pharmacy, 37 Dionisie Lupu Street, 020021 Bucharest, Romania; Phone +40722–352 050, e-mail: bogdan.galbinasu@yahoo.com

Received: February 23, 2014

Accepted: July 16, 2014