

## Case Report

## Clinical Prosthetic Rehabilitation of a Typical Diabetic Resorbed Alveolar Ridge

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**Abstract:** Complete denture is a gold standard therapy used in most cases of edentulous patients. But when the alveolar ridge is highly resorbed, a regular prosthetic base induces automatically a lack of stability and retention of dentures. In such challenging situations, conventional therapeutic alternative is not effective and other therapeutic solutions such as piezography and implants are preferred. This article reports a full prosthetic management of a highly resorbed mandibular alveolar ridge with the presence of a voluminous tongue, in order to improve prosthetic integration.

**Keywords:** Complete denture /diabetic/resorbed ridge/ /neutral zone/ inter-ridge distance/prosthetic balance.

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## INTRODUCTION

Bone resorption is a physiological involution that occurs systematically after tooth extraction and is more pronounced buccally than lingually. this process is related to senility or to some pathological factors such as nutritional deficiencies, systemic diseases, certain drugs [1, 2].

According to Atwood and Tallgren, this phenomenon accelerates during the first 3 post-extraction months and stabilize gradually at 2.5 years [1, 3-6].

In the dental practice, the prosthetic management of the cases with an exaggerated bone resorption is complicated by the collapse of the alveolar processes and the persistence of a low or negated ridge and the appearance of a bone bases shift. These consequences will compromise the prosthetic balance and cause aesthetic damage due to lack of support for the peripheral musculature. Thus, increased inter-ridge

space compound this problem by increasing the leverage (fig. 4).

The severely resorbed mandibular ridge is more challenging to impress than is the maxillary one [7]. The aim of this work is to adopt a prosthetic approach to overcome the difficulties encountered thereby enhancing stability, retention, and reducing the further resorption of the jaws. through the description and illustration of a clinical case.

## CASE REPORT

A 55-year-old male patient, Mr. B. D, wearier of a complete denture came to the Department of complete Prosthodontics at the dental clinic of Monastir. He was protesting about aesthetic and functional difficulties with no ability to masticate or to speak and smile in public because of his moving dentures and desired a new complete rehabilitation. The patient describes his prosthetic issue as an handicap that deprived him from having a normal social life and

impacted him psychologically to the point of choosing a night job for the last 5 years.

The patient history examination revealed that he has been a type 2 diabetic disease for more than 15 years and has been edentulous for 5 years .As an oral repercussion, we noticed a highly resorbed mandibular ridge with a normal mucosa tissue (Fig 1).



Fig-1

So, after informing the patient of all the options available to treat him, we did choose the neutral zone concept as a reasonable, well-advised treatment that can enhance the retention and stability, while an implant retained prosthesis isn't possible for psychological and financial reasons.

#### Clinical procedure

When the ridge is resorbed, the support, retention and stability are difficult to obtain. To improve the denture success, we decided to make a lower denture which covers the entire supporting available area, with its flange intensions in harmony with the surrounding musculature.

First, in order to record the denture bearing surface in its entirety to provide the patient with a functionally successful prosthesis, we proceeded by taking a mandibular primary impression using a low fusing impression compound (fig2) which is modeled and adjusted in mouth so the outline of the base or tray is correctly formed.



Fig-2

Then, we proceeded by recording the neutral zone which is a Potential space between lips and cheeks

on one side and tongue on the other side (or) where the muscular forces are equal.

To make the piezographic impression, Cast was poured in dental stone. And a special preformed metallic tray (lead wire) (fig3) was wrought over it and according to the configuration of the lower ridge arch, so it won't interfere with the peripheral musculature.



Fig-3

After checking the stability of the special tray in mouth, the polysulfide was placed around the tray. The patient is informed and trained to some oral manipulation then asked to read, speak and swallow with the tray in his mouth, we also associated Other oral functions for modeling, such as laughing and smiling, chewing, sucking, pursing of lips, in order to induce a functional modeling by compressive forces generated by oral muscle activity. Functional movements are also required after each series of oral functions solicitation. (à mettre le schéma démonstratif des si /SO/SE/TE/DE).

8 minutes later, the set impression was removed from the mouth, cleaned and checked (figure4), and the operation is repeated until all the necessary anatomical elements are obtained (Figure5).



Fig-4



**Fig-5**

After pouring the piezographic cast, Maxillary final impression was made followed by border molding with green-stick and final impression with silicone impression paste using a Customized tray (Fig. 6) which is fabricated with self-curing acrylic resin.



**Fig-6**

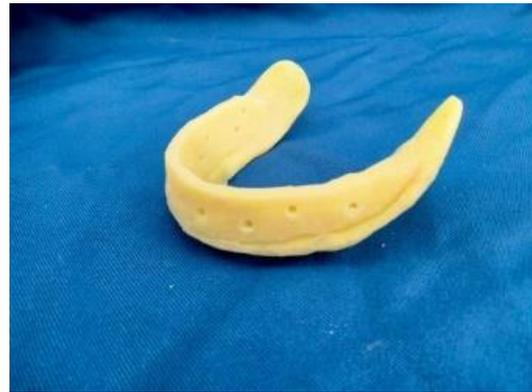
The maxilla-mandibular relationship was recorded using wax occlusal rims and transferred to the articulator (Fig7).



**Fig-7**

Then, we proceeded to the determination of the situation of the functional occlusal plane; First of all, from the piezographic cast, we fabricated another prosthetic mandibular base supported with a Brill blade

whose level is located 2 mm below the clinical occlusal plane (Figure 8).



**Fig-8**

Secondly, we induced the base and its edges by a light body elastomeric impression material, and then placed it in mouth and asked the patient to perform herbst movements and to speak with it.

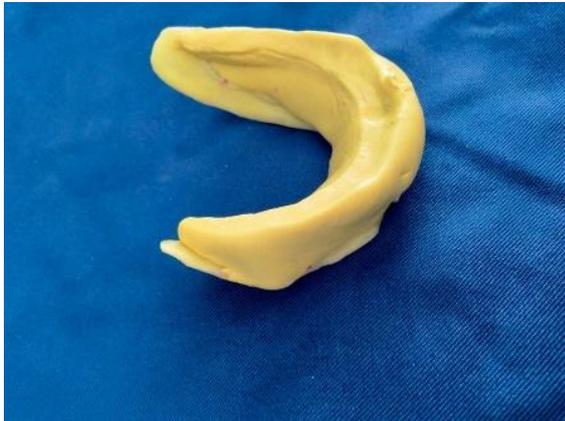


**Fig-9**

After the material setting, some compression zones and extensions appeared and were reduced in order to ensure that the base is in perfect harmony with the anatomy and function of the patient (Fig 9).

Third, we induced the trial mandibular base with a heavy impression material and the patient was instructed to perform various Orofacial movements so as to record the polished surface of the denture in harmony with the Orofacial musculature. The same course of piezographic actions was repeated again and performed the different functional movements to eliminate the material excess. The final part of the impression is taken while the mandible is in a rest position to apprehend the muscles balance position.

Once the piezogram determining the prosthetic corridor is obtained, the piezographic occlusion plane is determined on the posterior lingual and buccal muscle surfaces recorded on the piezogram (Fig10).



**Fig-10**

Thereafter, buccal and lingual silicone keys were made (Fig 11).



**Fig-11**

So, Heavy silicone is applied to the level of the occlusion plane, on each side of the piezogram, without forgetting to first carry out retentions on the model in order to facilitate the precise repositioning of the keys on the cast (Fig12).



**Fig-12**

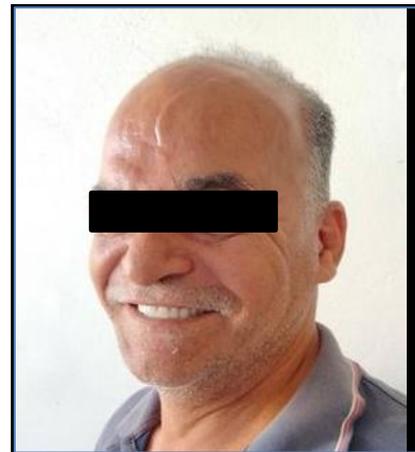
Then, the piezographic silicone bounded space is casted in hard wax and The teeth setting is handled with the respect of the concept of bilaterally balanced occlusion and the balanced physiological recorded zone of the mandibular.

So, aesthetic and functional requirements are associated promoting the acceptance and integration of the denture after its polymerization (Fig 13).



**Fig-13**

The mandibular denture was processed using the conventional procedures with the respect of the neutral zone recording. Wearing and oral hygiene advice were instructed to the patient, and follow-up appointments were scheduled (Fig14).



**Fig-14**

## DISCUSSION

Post extraction alveolar resorption is the result of the influence of many different systemic and local factors such as patient's age, mineral metabolism disorders, hormone disbalance, change of masticatory function, and inadequate remodeling stimuli of the alveolar bone tissue [8]. This phenomenon causes unstable and non-retentive mandibular complete dentures which results in constant trauma to the mucosa, pain, functional limitations (e.g. mastication and speech) and esthetic facial worsening [1].

Different alternatives are proposed to resolve this problem that includes preventive, conventional and osteointegrated approach.

Starting with preventive approach, it is imperative that teeth are extracted in an atraumatic manner in order to maximize and maintain the volume of the hard and soft tissues to increase future prosthesis success.

Dentist have also to control his patient's overall health namely diabetes, osteoporosis, hyperthyroidism which accelerates bone resorption besides, some studies have suggested a more severe resorption of the maxillary and mandibular residual alveolar ridges for denture wearing patients than the non-denture wearing patients ,hence the interest of a well-adapted prosthesis [1].

Last but not least, experienced prosthodontists are wary of radical tooth extraction in the mandible [9], despite the fact that overdentures are considered as a preferred alternative to complete dentures, especially in patients with insufficient alveolar bone support, the conservative approach to root preservation as abutments to enhance denture performance in both jaws is still valid.

Moreover, a conventional approach can be followed .it consists on making weight decreased conventional dentures with pre-prosthetic surgical intervention or without to improve denture's prognostic.

Pre-prosthetic surgeries such as vestibuloplasty, a bone graft followed by conventional complete denture prosthesis can be an optimal solution.

We can consider bone graft as a solution to resolve mandibular bone resorption for a better prosthetic rehabilitation, different techniques were developed for augmentation of bone height in resorbed ridges.

Different techniques are mentioned in the literature such as Distraction Osteogenesis which is mainly used for vertical ridge deficiencies.

Onlay bone grafting which is the positioning and securing of bone grafts on the surface of alveolar ridge. It can be either Block or Particulate onlay bone grafts.

And Guided Bone Regeneration (GBR) which can be used separately in a staged approach to first augment the ridge or in conjunction with implant placement when primary stability of the implant is desirable[10].

For this case, we opted for a conventional complete denture approach without surgical intervention. We chose for the preliminary impression, a low fusing compound which is indicated for highly resorbed mandibular ridge with no hypermobile tissue. This reversible impression material can be thermo-

modified in case of errors, to remake inaccurate portions without having to remake the entire impression. Besides, accuracy can be improved by flaming the surface material. However, we noticed some disadvantages such as the lack of details recording and, soft tissues Compression because of its high viscosity. (<https://www.juniordentist.com/impression-compound.html>)

Then, to improve prosthetic stability, we opted for piezography in order to locate the prosthesis in an area where the eccentric and concentric horizontal forces are balanced. So, the physical phenomena of adhesion is optimised by increasing the contact surface between the oral mucosa and the prosthetic extrados [11] and the prosthetic balance and retention are improved.

Indeed, the piezographic technique allows to acquire a maximum of stability by determining not only the neutral zone or the balance zone where the teeth will be arranged but also the functional occlusal plane which determinate the prosthetic teeth occlusal surfaces level using elastomeric impression materials and a modified special custom tray.

The adequate impression material should have fairly long recording fidelity, dimensional stability and plasticity time. So, tissue conditioners, silicone, polysulfide, polyether or eugenol zinc oxide can be used.

Although Piezography is a technique that allows an optimization of the various oral functions (mastication, phonation, swallowing),a better retention can be obtained if it was associated with an implant placement [2-4].

Actually, an osteointegrated approach can be followed, it consists on an implant or mini-implants supported overdenture for a removable denture or fixed hybrid prosthesis (all in four or a full arch retained denture).

Until now, the use of implants has dramatically improved treatment choices for most edentulous patients, and implant retained overdenture is a treatment option that could decrease resorption of the residual ridges, improve oral function, chewing force, comfort, quality of life and satisfaction for edentulous patients.

Various attachments or bars can be used to retain implant overdentures [12] but it may not be suitable for all patients particularly in less prosperous countries or for patients who are unable to afford costs associated with this treatment option such is the case for our patient [6].

Nevertheless, some studies proved that implants provide patients with higher bite forces, so

they could potentially concentrate hydrostatic stress and give rise to higher residual ridge resorption [13].

To minimize these risks, the use of mini-implants in the specialty of prosthodontics has become an option for patients who have limitations that precluding placement of conventional implants in particular, the quantity and/or quality of available bone is insufficient to accommodate the width of the implant, or for patients with an atrophic alveolar ridge, and cannot opt for an additional surgical procedure or may not be a viable candidate for surgery [14].

In addition, the hybrid restoration is a solution for patients who have experienced pain when using conventional complete denture prostheses, this type of restoration is dependent totally on the implants for support and can be provided for all edentulous patients who have sufficient bone and inter arch space to receive implants in the anterior mandible. Costs for this type of restoration are higher than overdenture prostheses, however, the satisfaction of patients is also higher [9, 15].

## CONCLUSION

Prosthetic rehabilitation to patients with atrophic residual alveolar ridges is challenging. Nowadays, different treatments for improving the denture stability and retention are suggested such as dental implant therapy and it depends on patient's overall health, economical condition and the patient's cooperation such is the case for our patient with whom we have opted for piezography; the aim of this technique is to construct a denture in muscle balance through physiologically appropriate denture tooth arrangement.

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