



Biofunctional Prosthetic System in Albania

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ABSTRACT: *The median age of the population contingent of patients wearing full removable dentures is rising. We are dealing with a situation where jawbones are more and more atrophied. In order to construct an efficient total prosthesis we were based on the Biofunctional System, elaborated by U.Stuttgen. The preparation process of these dentures was built on the principles of Guided Functional Movement. The aim of our study was to construct a full removable prosthesis according to bilateral balanced occlusion with no alterations,interferences,deformities and to compare it to conventional prosthesis in terms of stability, function, achievement of balanced occlusion, strength, mechanical resistance, decubitus, sore and aesthetics. As a study material,we included 245 patients treated by us, who observed in 6 year long period. We divided patients into two groups: in the first one 133 patients treated by using biofunctional prosthesis, and 112 patients were part of the second group treated using conventional dentures. Based on the check up immediately after putting on the dentures and 6 years later, we concluded and compared the results of the prosthesis systems in both groups. As a result, we concluded that biofunctional prosthesis had a high advantage compared to the conventional ones in all terms.*

Keywords: *bilateral balanced occlusion, biofunctional prosthesis, highly functional, stability.*

I. INTRODUCTION

An increase in average age of the population has caused a rise in the contingent of patients wearing full removable dentures. Lejoyeux, Harmel, Gerald, [8,21] highlight that full dentures make up for 33.2% of all total prosthesis. According to Zarb and Bolender [9], nowadays, 1/3 up to 1/2 of the population over 65 years old are edentulous, women being the most common ones. The most advanced system nowadays is the Biofunctional System, whose priorities are the principles of bilateral balanced articulation [3,10,11,16]. Biofunctional Prosthesis System (BPS) is also called biogenic or biofunctional, because of the ability to construct dentures which are really similar to the natural elements they substitute, fulfilling this way aesthetics , functional and phonetic demands of the patient [6,10,15,16,25]. The biofunctional prosthetic system is compound of a wide range of appliances, artificial teeth and materials combined in each working session starting from impression taking up to the final design of the denture. In this system, the whole work up process is built on the individual data recorded on the patient itself. In Biofunctional Prosthesis, it is paid importance to the different anatomical structures of the jaw and achieving a bilateral balanced occlusion. This provides a uniform distribution of the occlusal forces and minimizes the resorption of residual ridge [2,22,23].

II. AIM OF STUDY

Since full dentures built by traditional means cannot achieve optimal results and have many deficiencies, our goals were to:

- 1- Construct full dentures that ensure a greater stability and better, faster adaption than conventional prosthesis;
- 2- Construct Total biofunctional prosthesis according to the principles of bilateral balanced occlusion with no alterations, deformities or interferences;
- 3- Define the positive effects and advantages that Biofunctional Prosthesis show compared to the traditional ones.

III. MATERIALS AND METHODS

During a 6 year long period we treated 245 patients of different age, 35-50 years old, 50-65 years old and above 65 years old (average age:57 years old).

We divided our patients into 2 groups:

In the first group were included 133 patients, wearing biofunctional Prosthesis in bilateral balanced occlusion;
In the second group were included 112 patients wearing conventional full dentures in unilateral balanced occlusion.

The working method in preparing the biofunctional prosthesis is completely different compared to that of the conventional one. In both our group of patients we conducted short term check up in the following 2 week up to 3 months, comparing the results and clinical terms in each group. In 3-6 years following long term checkups we evaluated the clinical parameters in terms of the effect of the denture in the prosthetic area like: continuing resorption of the residual ridge and the state of the mucosa underneath it. Our study results were based in different markers like: Passive stability and Functional Stability of the denture, decubitus, and interferences. It is also important to emphasize the fact that the patient is adjusted at a faster rate using these types of dentures, where the incidence of denture stomatitis is lower and the need for readjustments is greatly diminished.

3.1 Clinical Material

The preparation process begins with the impression technique, which in the biofunctional prosthesis is unique and special.

1- Anatomical impression (or functional depending on the dentist's choice) is also followed by a second impression taking process in central occlusion through a centric tray. This way we managed to have an individual tray and Bite-blocks which are exact or almost exact to the central occlusal position. We use this individual tray to take a functional compressive impression with both jaws joint in central occlusion (**Fig. 1 a-f**).

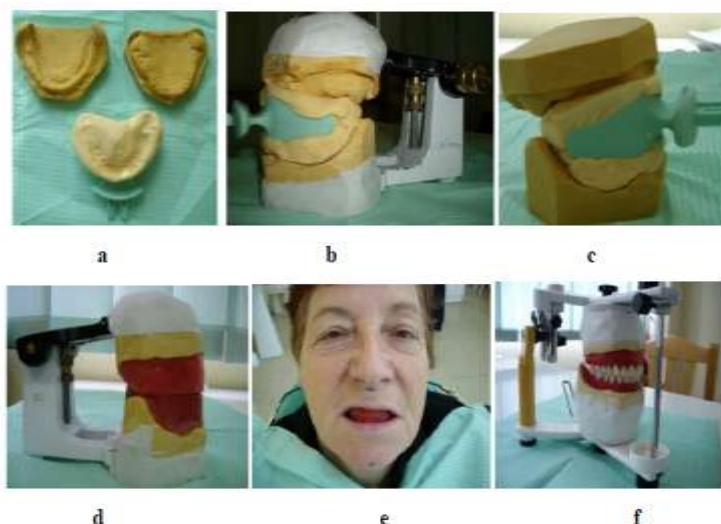


Fig.1: **a-**Impression and working cast, **b-** positioning of cast in central tray, **c-**repositioning in articulator, **d-** preparing the individual trays and bite templates in central, **e-** final definition of central occlusion, **f-** Wax up denture trial

2- As for the functional impression technique, we used for the first time the individualization and personal registration of the Postdam Area. This concept is primarily introduced in this technique which upon now was recognized as a single line; the Postdam or Vibration Area represents the area where the soft and hard palate combine. In this area, the mucosal tissue shows a high resilience. The Postdam makes up for the most important zone in determining the stability and posterior adhesion of the upper denture.

3.2 The Palate Sealing Technique

The palate sealing should sum up:

A previous phase of Individualizing the Postdam Area and a following phase of recording it:

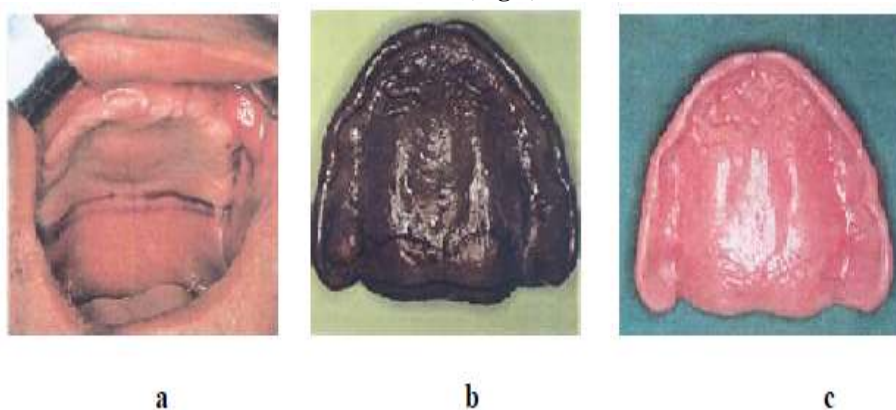
-Individualization of the Postdam means defining the exact posterior border of the denture.

Recording the Postdam means defining the depth of the posterior border into the palatal mucosal tissue, at the fusing area between the soft and hard palate.

We used this technique in the functional recording of the Postdam Area:

First of all the functional impression was taken. Then the posterior vibrating line was marked in the patients mouth through a copying pencil (by pronouncing the AH sound) and the anterior line by blowing the nose with closed nostrils. The mucosal area between the two lines represents the vibration zone (Postdam). We reposition the functional impression in the oral cavity and apply pressure to it. Both lines will appear on the impression material. In between these lines we apply a small amount of material, same as at the functional impression and we reposition the tray back to the oral cavity. Then we tell the patient to pronounce a long and light AH sound in order for the soft palate to rise up and let this space get filled by the material we applied in the vibrating zone. This will also be reflected in the mucosal surface of the future denture and suppress the mucosal tissue in the vibration area, by acting as a barrier for air pressure, similar to the gouge process in practice. The advantage of this technique consists in that the pressure the denture applies into the mucosa is individually recorded, based on the soft tissue resilience of the patient and not in random ways such as the scraping process

(Fig.2).



In defining the **central occlusion** we were based on anatomical criteria in terms of the level of the Occlusal Plane (Tongue Relation, Alveolar Mandible Tubercular etc) as well as phonetic criteria which were considered secondary in the previous clinical practice. We choose the graphic method in defining the central occlusion through a Gnathometer (Gothic Arch). This is an entirely physiological technique which is based on forming a pathway of mandible movements [12,14,20]. In the basal plate of one of the templates (the plate must always be constructed on resin) we pin down the gnathometer's plate, tinted with colored wax. In the other jaw's basal plate we pin down the plate with the pointing needle. We ask the patient to carry out propulsive, retropulsive and lateral movements of the mandible. This way the track of all movements is achieved. The intercrossing of all pathways determines the point of central occlusion. In this final position we pin down both templates eventually.

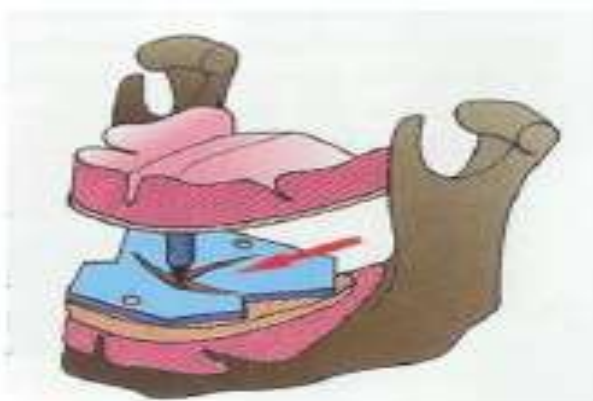
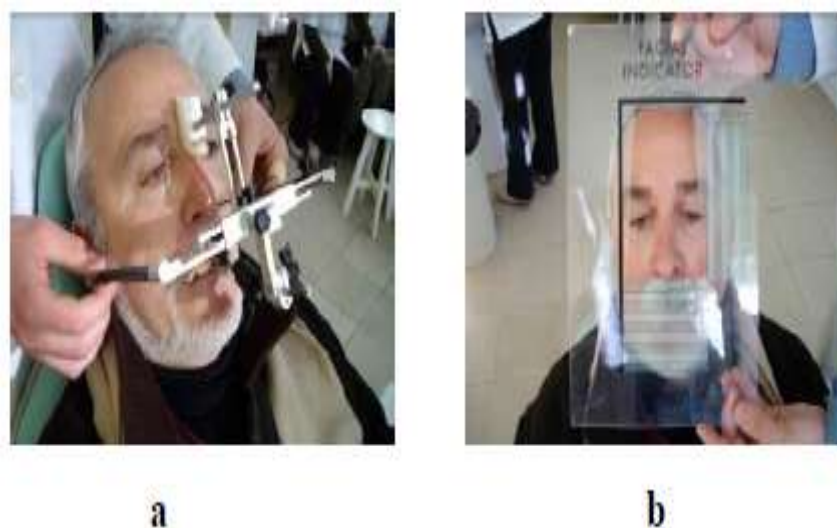


Fig. 3- Defining the central occlusion through graphic technique and gnathometer. In aligning the teeth in bilateral balanced occlusion we used the Stratos 200 Articulator (Fig. 4 a,b,c).



Fig.4: a- Articulator Stratos 200, **b-** its accessories, **c-**Bi-dimensional Guide

The Stratos 200 Articulator is an Archon-type articulator, semi-adjustable, equipped with a wide range of accessories [2,3,6,15]. In this one you can register individual data from the patient through the facial bow. In aligning teeth in bilateral balanced occlusion and achieving simultaneous contact during different movements, we used a special accessory: The Bi-dimensional Guide (Fig.5c). In difficult clinical cases, such as extreme size of cranium and jaw and pathological occlusion, we paid special attention to patient's individual data recording through the Facial Bow (Fig.5.a).



In order to achieve a highly aesthetics, we took into consideration choosing the right artificial teeth based on many methods and parameters (gender, size, shape of face, shape of maxilla, physical constitution of the patient Fig.5b). The posterior teeth were chosen according to functional requirements [1,8,9,18]. We preferred the N-type of posterior teeth, with reduced cuspid morphology (angle =22°).

3.3 The alignment of teeth in Stratos 200 Articulator was attained according to bilateral balanced occlusion.

During the final preparation process of BPS denture, in order to keep constant bilateral balanced occlusion relation, we established a polymerization procedure as in the **SR-IVOCAP** pressure system [5,22,24]. In this system, the polymerization is preceded in layers from down-up. The soft material of upper layers, under the constant pressure of 6atm, compensates the shrinkage of lower layers already polymerized. This provides no deformities of the denture after polymerization, avoids alterations of occlusal relation, interferences, pores in resin and leads to a more exact adhesion of the denture and mucosa [3,6,10,19].



Fig. 6: Completed denture

During the final try out of the completed denture, we verified the multi-point contact in different movements of the mandible in order to ensure the bilateral balanced occlusion.

IV. RESULTS AND DISCUSSION

The analysis and conclusions of our work are based on the results accomplished from treating 245 patients through complete removable denture; 112 conventional dentures and 133 Biofunctional dentures. We divided the patients according to age into three groups: 35-50 years old, 50-65 years old and above 65 years old. We also analyzed in details the types of jaw atrophy in groups, degree of resorption, type of teeth used, sorting patients according to variations of Postdam Area etc. The results achieved in this process we sustained in to the following index:

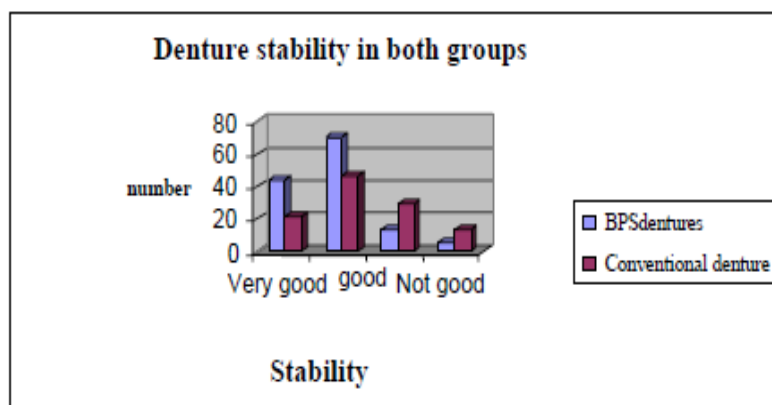
- 1- Subjective Data Evidence
- 2- Clinical Data Evidence
- 3- Adjacent Results

Subjective data are those obtained from the patients themselves who refer that the adjustment process was faster in Biofunctional Prosthesis.

Clinical data: According to our continuous check up on our patients, we evaluated the adaption in both types of denture, the chewing process, functional stability, decubitus, aesthetics, phonetics etc.

Adjacent results: We observed our patients from the implementation period up to 3 months. In the early check up (within 10 days) we evaluated these results:

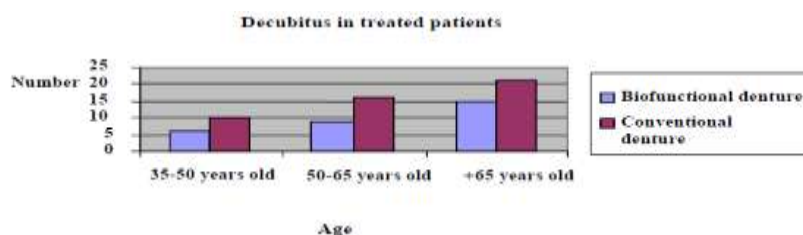
1. **Stability:** Nearly 2 weeks after treatment, we examined the stability of the denture in passive and functional condition. We classified the Stability into 4 categories according to the patients review: very good , good, sufficient, not good (Graph 1).



Graph.1: Shows the stability of denture in both groups of patients.

According to our results [4,17,19,24] and those of foreign authors [1,2,7,8,12,13] we noticed that in terms of stability during mastication, phonetics and rest, was way higher in Biofunctional Prosthesis than in conventional dentures. As you can see, in BPS the stability is far better with 33.1% of the cases compared to 19.7% in traditional dentures.

Decubitus: Another evaluation parameter was the presence of pressure sores in the treated patients. We considered as a decubitus more than 1 episode of pressure sore. We think that the presence of these lesions is related to the technique of polymerization (The SR-IVOCAP avoids the shrinking and alteration of the denture) and also to the dismissal of functional overload in specific areas during mastication, as a result of unbalanced occlusion. The results are shown in Graph.2.



Graph.2: Shows the decubitus after placing denture (by age).

In BPS 22.5% and conventional ones 41.9% of the cases. From this chart you can see that in Biofunctional prosthesis the number of pressure sores is way lower and we think this is directly related to the polymerization technique and teeth alignment according to bilateral balanced occlusion. To summarize in Chart 1 we listed all concerns of both groups of patients after treatment. As we can see, the discomfort is pointed out more in patients of conventional denture.

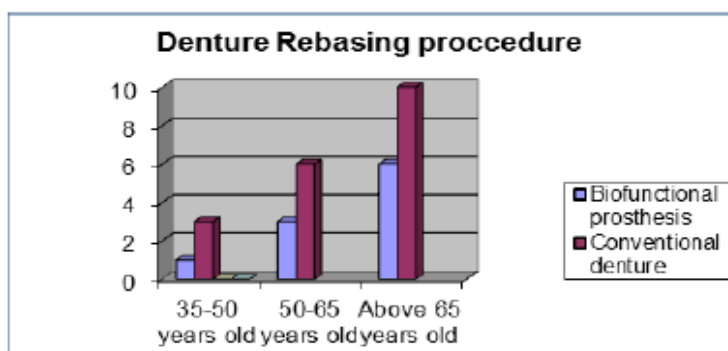
Complaints	Conventional Denture	Biofunctional Prosthesis
	Nr.of patients	Nr.of patients
Decubitus	47 41.9 %	30 22.5 %
Functional shifting	43 38.3%	18 13,6%
Phonetic discomfort	6 5.3 %	3 2.6 %
Grinding	4 3.5 %	4 3 %
Taste disorder	3 2.7 %	2 1.5 %
Cheek biting	4 3.5 %	3 2.6 %
Nausea	3 2.7 %	2 1.5 %
Aesthetic complaint	7 6.2 %	6 4.5 %

Table.1: Complaints of patients of both groups immediately after treatment.

In many aspects we can see the advantage of Biofunctional Prosthesis System to the Conventional Dentures.

4.1 Distant result

We achieved these results from our checkups in 1-2-3-6 years following period. Alveolar process resorption (residual ridge).



Graph.3: shows rebasing process done 3-6 years after denture establishment in both groups of patients.

In biofunctional prosthesis, due to the bilateral balanced occlusion, we achieve a uniform distribution of forces in all prosthetic area. This minimizes the resorption of residual ridge and the need for further rebasing procedures. Graph 3 shows the rebasing stage in both groups of patients. As you can see from Graph.3, in patients wearing conventional dentures, the need for further rebasing procedure rises up to 16.9% compared to

7.5% in Biofunctional Prosthesis, as a result of a faster resorption of the alveolar process due to the overload of specific areas during mastication in unilateral balanced occlusion dentures.

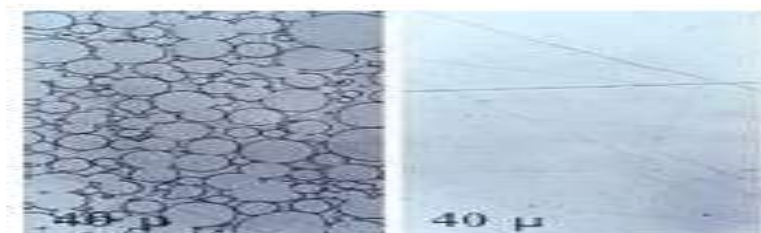


Fig.7: Microscopic structure of the material used in conventional denture and Biofunctional ones (SR-Ivocap) after polymerization.

V. CONCLUSION

1. In BPS due to bilateral balanced occlusion, it was achieved a higher stability of the denture in function and resting condition in 86.4% of the cases, compared to 60% in conventional denture cases.
2. Biofunctional Prosthesis reduced in a great rate the cases of pressure sores, stomatitis and oral candidiasis.
3. The preparing procedure of BPS in a bilateral balanced occlusion decelerated the resorption process compared to the ridge atrophy in conventional dentures.
4. Noticing the advantage of BPS in each term, we consider it to be far more efficient than conventional denture in every aspect. It optimally fulfills the aesthetic, functional and phonetic demands of the patients.

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