

## TOTAL EDENTATION TREATMENT USING MOBILE IMPLANT-SUPPORTED TOTAL DENTURES

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**Abstract:** 12 (8 m., 4 w.) patients, aged between 55 and 75 years, with different forms of total edentia, uni and/or bimaxillary, were selected, complexly examined and treated prosthetically. It was found that, because the clinical picture of total edentulism is determined by a series of involutive processes (atrophy, resorption), its prosthetic treatment requires the consideration of numerous retention factors (physical, mechanical, physiological). The correct evaluation of these factors will ensure the requirements of all the fundamental principles of biomechanics, respectively the integration of the prosthetic part with the elements of the stomatognathic system and of the body in general.

**Key words:** total edentulism, retention factors, implant-supported total dentures.

### Introduction

Total edentulous condition is the state of missing all teeth in the oral cavity; this means a considerable handicap for each patient from functional (mastication) as well as from the phonetic, esthetical, psychological and social point of view [3]. Most teeth are extracted as a result of caries or periodontal disease. The former is the most common oral disease in the younger age groups, while periodontal disease increases in prevalence and severity with increasing age. These two age categories have different demands, wishes, motivation and also a different adaptability to new complete dentures [16, 17].

Bone loss is an ongoing process following tooth loss, affecting the mandible four times more than the maxilla. Edentulism was found to have a significant effect on residual ridge resorption which leads to a reduction in the height of alveolar bone and the

size of the denture bearing area. This reduction affects face height and facial appearance, which are altered following total tooth loss. The loss of alveolar bone height and width also leads to substantial changes in the soft-tissue profile, such as protrusion of the mandibular lip and chin [9].

Edentulism can be accompanied by functional and sensory deficiencies of the oral mucosa, oral musculature, and the salivary glands. Decreased tissue regeneration and decreased tissue resistance are expected in the edentulous population, which can impair the protective function of the oral mucosa. Associations have been reported between aging, denture use, and oral mucosal disorders, including denture stomatitis, an inflammatory condition of the palatal mucosa seen in complete denture wearers, angular cheilitis, oral candidiasis, and traumatic ulcers, which may become malignant, especially if the

protective functions of oral mucosa are decreased [2, 19-27].

According to several studies, tooth loss can affect general health in several ways indicated as follows:

- Lower intake of fruits and vegetables, fiber, and carotene and increased cholesterol and saturated fats, in addition to a higher prevalence of obesity, can increase the risk of cardiovascular diseases and gastrointestinal disorders.
- Increased rates of chronic inflammatory changes of the gastric mucosa, upper gastrointestinal and pancreatic cancer, and higher rates of peptic or duodenal ulcers.
- Increased risk of noninsulin-dependent diabetes mellitus.
- Increased risk of electrocardiographic abnormalities, hypertension, heart failure, ischemic heart disease, stroke, and aortic valve sclerosis .
- Decreased daily function, physical activity, and physical domains of health-related quality of life.
- Increased risk of chronic kidney disease.
- Association between edentulism and sleep-disordered breathing, including obstructive sleep apnea [1].

Removable complete dentures replace missing natural teeth and adjacent alveolar ridges. The complete denture fabrication involves specific working procedures at the chair side and in the prosthetic laboratory. We deal with individual problems concerning denture support, retention and stability, inter-jaw relations and the arrangement of the artificial teeth. The size, shape and color of artificial teeth are a very important aspect of the complete edentulous rehabilitation and sometimes become a field of discussion when the patient's wishes and the doctor's opinion

do not correspond. The final solution is usually a compromise [4].

An implant-supported total denture (fig. 1,2) is a removable complete denture combined with implants designed to improve stability in the oral environment. Depending on their support, we may classify them in: a) Implant-retained and mucous-supported overdentures, if the denture is buttressed by tissues and are retained on the implants, and b) Implant-retained and supported overdenture, if support and retention are due to the implants that behave as a fixed denture but the patient can remove it for an adequate oral hygiene [6].

If there are severe or moderate anatomical conditions, with great bone posterior alveolar ridge reabsorptions and retention, support and stability loss, as well as high patient's demand, it will be indicated to use a splinted or unsplinted four-implant-supported overdenture.

Another option would be to use a splinted three-implant-supported overdenture that will limit denture rotation dislodgement. Geckili et al. in a 3-year follow-up study, of patients wearing mandibular three-implant-supported overdentures, found 100% of survival rate [10].

In 1986, Babbush et al. in an 8-year follow-up study of edentulous patients treated with splinted four-implant-supported overdentures, reported an 88% survival rate. In 1997, Chiapasco et al. in a 6-year follow-up study with 226 edentulous patients with same implant-supported total dentures as last, reported a 96.9% survival rate. In 2000, Gatti et al. showed a survival rate over 96% [5, 7, 14].

In 2011, Burns et al. concluded that the greatest retention was found with four splinted implants with a bar although patients show a higher satisfaction with ball attachments in a survey of 30 patients treated with four-implant-supported overdenture and ball or bar attachments [13].

Comparative studies by Rashid et al. and Assunção et al. in patients wearing

conventional dentures and implant-supported total dentures, they concluded that: implant-supported total dentures produced less bone reabsorption, had greater retention and stability and that they possess a better chewing function, thus increasing patients' satisfaction and improving their quality of life [8, 15].

Ueda et al. performed a 24-years follow-up study in patients wearing a mandibular implant-supported total dentures with bar or ball attachments, obtaining 85.9% of survival rate and concluded that implant-supported total dentures constitute a long-term success treatment [11,18].



*Fig. 1 mandibular over-denture*



*Fig. 2 Maxillary over-denture*

### **Purpose**

The evaluation of the particularities of the clinical aspect in total edentia, and the appreciation of the use of implants in prosthodontic treatment with implant-supported total dentures.

### **MATERIALS AND METHODS OF RESEARCH**

The study consisted of 12 patients between the ages of 55 till 75, 4 female and 8 male residence in the Republic of Moldova were invited to participate in this study. All patients were informed about the characteristics of the study and granted a signed consent form. All of them presented edentulism in the upper or lower jaw. Selection of patients for the study was conducted by the inclusion and exclusion criteria.

- Inclusion criteria: Total edentulous patients (upper or lower jaw or both). Patients with sufficient bone quantity to accommodate prescribed implant dimensions. Systemic health status, which permits a minor surgical procedure.

- Exclusion criteria: Partially edentulous patients. Mentally disordered patients. Patients younger than 50 years old. Patients with severe systemic diseases.

Assessment of patients was carried out using conventional patient clinical examinations, emphasizing the oral examination. Digital panoramic radiography was performed paraclinically, CT scan was performed for patients before implantation.

The study was conducted in the chair of orthopedic dentistry "Iarion Postolachi", faculty of dentistry, state university of medicine and pharmacy "Nicolae Testemitanu"

**Clinical instrumental examination** was done using conventional methods of patient examination on the basis of which was formulated a correct and complete diagnosis and treatment plan, thus the examination consisted of patients interrogation, inspection, palpation, percussion and auscultation. discussing and evaluating patients complaints, abnormal changes due to total edentia, the history of the current disease based on the etiological factors that determined the loss of

teeth, the evolution of the edentation, previous prosthetic treatment (if existed). Life anamnesis should be conducted with special attention given to systemic diseases such as hepatitis, TB, HIV/AIDS etc.

*Extra-oral examination:* The overall appearance of the patient should be noted. The symmetry of the face should also be noted, and any abnormal movements about the jaws during speech. It may also be possible to detect abnormal clenching or grinding habits. The general development of the facial musculature should be observed. The lips should be observed for their general characteristics such as length and mobility during speech and whether they appear tense and might therefore exert strong lingually directed forces against the anterior teeth. Any deep creasing, inflammation or scarring at the angles of the mouth should also be noted, the apparent skeletal base relationship should be noted following observation of the profile, as this information will be useful in assisting the development of correct tooth positions. The nasolabial angle may also be determined by profile observation of the patient. Temporomandibular joint activity should be observed and any asymmetry of action during opening and lateral movements of the jaws noted. The presence of any clicking or crepitus or any present or past pain in the region of the joints should be recorded.

*Intra-oral examination:* This phase of the clinical examination requires a knowledge of disease states affecting or involving the hard and soft tissues of the mouth. The mucous membranes should be carefully examined. Any areas of inflammation or other pathology should be noted. The standard of oral hygiene must be noted, Gingival Index the periodontal state should be recorded. The condition at the time of examination must be recorded to provide a base line so that the effects of treatment can be determined objectively [3, 28-37]

*Support area:* bone component (bone substrate) and fixed mucosa.

*Suction zone (marginal, valve closure):* oral mucosa from the vestibular and lingual sac, the mobile mucosa of the cheeks, tongue and lips, which contacts the outer surface of the dentures, movable passive mucosa (neutral area) and transition area from the hard to the soft palatum (Ah line).

*The tongue:* The tongue will have a strong influence on denture design, especially for a lower denture, and note should be made of its size and mobility. A large tongue may also suffer mechanical irritation resulting from friction with a denture. *Saliva:* it has been pointed out that the presence of saliva is essential for denture retention, particularly for complete denture wearers. [3]

### **Radiological examination**

In order to assess further patients presenting for denture treatment, a radiographic examination may be required. The amount of bony support available, may be disclosed using radiographs. The nature of the residual alveolar bone may provide a valuable indication of possible reactions to denture treatment.

Regarding the **biomechanics of complete denture**, the following factors of retention were studied:

#### *Physical Factors of Retention:*

- Adhesion
- Cohesion
- Atmospheric Pressure
- Capillarity

#### *Mechanical Factors of Retention:*

- Undercut
- Use of springs
- Incorporation of Rubber Suction Discs/Suction Chambers
- Use of Magnets
- Implants

#### *Physiologic Factors:*

- Oral and Facial Musculature
- Neuromuscular forces
- Saliva
- Jaw Size
- Type and Class of Soft Palate

## RESULTS AND DISCUSSIONS

In order to obtain satisfactory result, over-implant removable dentures for patients with total edentulism there are a lot of key factors that play an important role in determining the end result of our treatment such as bone density, support structures, border limiting structures and the biomechanics of implants supported prosthesis which help reduce complications with stress and loading of the prosthesis

*Amount of Bone Present:* When adequate bone is not available in the planned locations of the implants, bone augmentation/grafting procedures are more likely to be required. In situations where a good anteroposterior spread of the implants cannot be achieved, an implant-assisted removable prosthesis is a suitable option. In cases with moderate to severe ridge resorption, the control provided by the implant-assisted removable prosthesis is an important factor to be considered during treatment planning .

*Lip Support:* Upper lip support in dentate individuals is derived from the maxillary anterior ridge and the maxillary anterior teeth. The prominence of the premaxillary ridge determines the upper lip support in edentulous patients. The maxilla resorbs cranially and medially, assuming a more palatal position following resorption. Thus, a majority of patients who have been edentulous in the maxillary arch for extended periods of time have inadequate lip support due to residual ridge resorption. In these patients, the prosthetic teeth have to be placed in their natural position (labial to the ridge) to adequately support the upper lip. An implant fixed complete denture is less likely to provide the required lip support, as compared to an implant overdenture with its base and labial flange, when there is a major discrepancy between the facio-lingual position of the prosthetic teeth and the residual ridge. In such

patients, an implant over denture is the treatment of choice .

*Smile-Line and Lip Length:* Since upper lip length and lip mobility affect the tooth display and aesthetics, patients with a high smile-line and/or a short upper lip, who display the alveolar ridge during smiling, should be treatment planned for implant over dentures to prevent an aesthetic compromise .

*Facial Support:* Aging, along with the loss of teeth, leads to loss of muscle mass and tone of the masticatory and facial muscles. Loss of muscle mass changes the facial appearance from convex to concave. The thickness of the flanges of the existing dentures should be inspected to determine if they possess the necessary thickness to provide the required cheek and lip support. Presence of wrinkles, deep naso-labial folds, and the concave contour of cheeks, are also indicative of poor muscle mass and tone. Patients with a concave profile and inadequate facial support need an implant-assisted removable prosthesis to aid in compensation of the lost muscle mass and tone .

*Maxillo-Mandibular Ridge Relationship:* The ridge relationship becomes altered due to bone resorption, causing changes in the size and form of the maxillary and mandibular ridges, varying the skeletal jaw relationship and degree of overclosure. Residual ridge resorption results in narrowing of the maxilla and widening of the mandible. In these patients, an implant overdenture can help compensate for the retrognathic appearance of the maxilla and/or the prognathic appearance of the mandible.

*Aesthetic Space:* Aesthetic space is the space between the ridge crest and the corresponding lips at repose. The lip ruler can be utilized to determine the vertical distance between the ridge crests to the corresponding lip at repose. This vertical distance allows the dentist to determine the space available for the prosthesis (implant attachments, bars, or fixed restorations).

*Parafunctional Habits:* Patients with a history of bruxism should be treatment planned for implant over dentures because they can be removed at night and thereby decreases the impact of bruxism upon prosthesis wear. The use of an over denture is especially important if the opposing arch has natural dentition or a fixed implant restoration, as greater forces will be applied to the implant prosthesis .

*Speech:* Speech is an important aspect of oral function. Patients with a history of speech disorders will face difficulties in producing articulated speech with implant-assisted fixed and removable restorations as well. However, a removable prosthesis is easier to remove in order to modify its base form to improve speech .

*Oral Hygiene:* When planning prosthetic therapy in the edentulous patient, the type and design of the restoration should be selected based on the level of oral hygiene compliance the patient has demonstrated .

#### **Advantages of implant-supported total dentures :**

- Reduces bone atrophy and gingival recession degree.
- Improved aesthetics
- Improved stability (reduces or eliminate prosthesis movement)
- Improved occlusion
- Decrease in soft tissue abrasion
- Improved chewing efficiency and force
- Improved retention
- Improved support
- Improved speech
- Free palate, improves taste sensation.

#### **Disadvantages of implant-supported total dentures :**

- Requires proper plaque control and denture hygiene
- It is more expensive if compared to Removable Complete Dentures.
- The lack of sufficient inter-arch space makes an overdenture system more difficult to fabricate and more prone to component fatigue and fracture.
- Necessity of many visits to complete the rehabilitation.
- Surgical complications.
- Implant loss.

#### **CONCLUSIONS**

1. The clinical picture of the total edentia is influenced by involution processes: resorption (due to lack of functional stimulation) and atrophy (through lack of nutrition). Indications for prosthetic treatment are determined by: bone availability, organization and structure of the bone, fibromucosis status, topographical ratios with important adjacent anatomical markers
2. Biomechanical considerations within an implanto-prosthetic treatment plan are determined by the following features: stability, topography, length, diameter and number of implants
3. The algorithm of the total edentia treatment with over-implant removable dentures, is based on the particularities of the clinical picture and has as support the biomechanical fundamentals criterias of the prosthetic implant treatment

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