CLINICAL AND BIOLOGICAL ASPECTS OF THE IMMEDIATE LOADING OF IMPLANTS

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Abstract: *Achieving natural looking implants for the restoration of areas of major aesthetic importance. For this purpose we consider many factors. The first is, definitely, osseointegration, then, the treatment planning for obtaining an aesthetic smile is based both on scientific and artistic principles. Material and methods: The study was conducted on a group of 78 patients, who had fixed prosthetic restorations on implants in the anterior jaw, of both genders, aged between 20 and 50 years old. Results: The overall data submitted let us state that the gums and papillae adjacent to the restoration are crucial elements. Assuming that bone and gingival architecture around the edentulous space is acceptable, preserving bone and soft tissue contours is the target of restorative therapy of areas with major aesthetic importance. This result can be achieved by insertion of implants followed by immediate provisional prosthesis. After soft tissue healing, the choice of restoration material can significantly affect the final outcome. Conclusions: Aesthetics in the anterior area depends on a number of factors. In the case illustrated, the implant platform and its surface were used to increase the stability of the implant and to prevent bone loss without which it would have been impossible to preserve the soft tissue. The patient's occlusion enabled the implants' insertion, abutment placement and provisional prosthesis immediately after extraction, thus, maintaining gingival architecture during healing.*

Cuvinte cheie: *estetica pe implanturi, monitorizare postimplantară, zona frontală maxilară*

Rezumat: *Obiectiv: Obţinerea unui aspect natural în cazul restaurării prin implante a zonelor cu importanţă estetică majoră. Pentru atingerea acestui scop se iau în calcul mai mulţi factori. Primul, categoric, este osteointegrarea, apoi, planul de tratament pentru obţinerea unui zâmbet estetic ce se bazează atât pe principii ştiinţifice, cât şi artistice. Material şi metodă: Studiul a fost realizat pe un lot de 78 de pacienţi, care prezentau restaurări protetice fixe pe implanturi, în zona maxilară anterioară, de ambele sexe, cu vârsta cuprinsă între 20 şi 50 de ani. Rezultate: Datele generale prezentate ne fac să susţinem că gingia şi papilele adiacente restaurării sunt elemente estetice cruciale. Presupunând că arhitectura osoasă şi gingivală din jurul breşei edentate este acceptabilă, conservarea contururilor osoase şi a ţesutului moale este ţinta terapiei restaurative a zonelor cu importanţă estetică majoră. Acest rezultat se poate obţine prin inserarea de implante, urmată de protezare provizorie imediată. După vindecarea ţesutului moale, alegerea materialului pentru restaurare poate afecta semnificativ aspectul final. Concluzii: Estetica în zona frontală depinde de o serie de factori. În cazul acestui pacient, platforma implantului şi suprafaţa acestuia au fost utilizate pentru a creşte stabilitatea implantului şi pentru a preveni pierderea osoasă fără de care nu ar fi fost posibilă conservarea ţesutului moale. Ocluzia pacientului a permis inserarea implantelor, plasarea bontului şi protezarea provizorie imediat postextracţională, contribuind astfel la menţinerea arhitecturii gingivale în perioada de vindecare.*

Dramatic changes occurred in the dental practice due to the introduction of titanium by Branemark in 1952, and the development of the concept of osseointegration.

Osseointegration is defined as "direct structural and functional connection between ordered vital bone and implant surface that supports a load". Condensation of trabecular bone around the titanium screw and cortical bone integration were described by the Branemark team in 1983.

Branemark protocol for inserting titanium implants involves:

1. Creating cavity for titanium implants by milling;
2. Using a two-stage surgical procedure;
3. Pending a healing period of 3-6 months without occlusal stress;
4. Use an atraumatic surgical technique;
5. Radiograph at the end of the healing period;
6. Restoration through acrylic occlusal surfaces.

Following this strict protocol, high rates of success are obtained. Implant survival rate, at 3-6 months, is 99.7%.

The osseointegration stages described by Branemark, Zarb and Alberktsson are:

1. Primary fixation;
2. Callus formation;
3. Remodelling into mature functional bone. When this process is disrupted, pseudointegration takes place.

The etiologic factors of this phenomenon:

- preparation trauma;
- infection;
- preintegration loading;
- postintegration overload.

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Early loading is defined as loading within physiologic limits applied on implants before completion of osseointegration.

Rationale for immediate loading of dental implant

The two-stage technique of inserting implants was the preferred protocol for many years. Recently, it has been demonstrated that the Branemark implant, whether in a one-stage or a two-stage surgical protocol leads to the same results in terms of the adaptation of soft tissue and the bone support. Therefore, the success rate of one–stage implants is of 95.5% after 6 years, similar to that obtained from a two-stage protocol (94.6%). Moreover, immediate loading proved to have similar success rates with delayed loading.

Clinical studies show that implantation followed by coverage and late loading are not required in any situation. This raises into question the practice of healing waiting for three months in the mandible and maxillary six months before the onset of prosthetic treatment phase (as suggested by Branemark).

Evidence of fibrous encapsulation after immediate loading

In the early 70s, Chercheve and Linkow claimed that fibrous tissue interposition between the implant surface and the bone is the best response, because it mimics the periodontal ligament. Moreover, immediate loading was considered vital to avoiding loss of alveolar ridge after extraction.

Subsequently, Brunski discovered that excessive micro-movements cause fibrous healing scars. Studies conducted by the Branemark team in the late 70s confirmed that immediate loading can lead to fibrous tissue interposition. However, it has been argued that insufficient healing time greatly increases the risk of implant mobility, sooner or later. The necrotic bone formed after immediate loading can act as an encapsulated fibrous attachment around the implant, being unable to withstand the physiological demands similar to the mature bone.

The theory of new bone formation induction by immediate loading

Although the Branemark team vehemently rejects this theory, it motivates the biological support of immediate loading: “the region in the vicinity of the implant remodels in response to the masticatory demands, turning itself from bone callus into functional mature bone. That is, the transition from the callus stage to remodelling and then to mature bone depends on the implants’ masticatory function In other words, the implant discovery and its operation in occlusion are positive factors that contribute to bone modelling; various studies conducted on animals confirm this supposition.

Small versus large amplitude movements, surface features and immediate loading

In the 80s, Pilliar stated that bone integration will occur only in the presence of small amplitude movements. 150-500/μm movements are considered excessive and disruptive for osteogenesis. Even the movements of about 100 μm have been considered possible causes of fibrous repair rather than of osseointegration. However, the amplitudes of 30-50μm are considered tolerable for new peri-implant bone formation. These studies prove that the most important individual factor for successful osseointegration is the stability of the implant and not implant covering or the time between insertion and functional demand. Surface roughness has been proved to influence peri-implant bone density. For example, the implant surface influences the amount of stress transmitted from the implant to the bone. Several studies point out that the influence of small amplitude movements on the implantation result depends on the surface. In less than ideal conditions, the porous cylinder allows apophyses bone, while the smooth screw loses its primary stability and is encapsulated into a membrane. It seems that, from a biomechanical point of view, smooth surfaces are not always the most suitable for cancellous bone adhesion. On the other hand, the texture of plasma coated titanium implants (TPS - titanium plasma sprayed) or those blasted cause the appearance of heterogeneous force fields around functioning implants, stimulating new bone formation.

Coating implants in calcium phosphate increases their tolerance to small amplitude movements. Similarly, a study conducted by Orenstein demonstrates that there is an interrelation between surface texture, implant mobility upon insertion and successful osseointegration.

Thus, the survival rate of implants coated with hydroxyapatite (HA) upon insertion is 91.8% versus 53.6% for those without HA.

Figure no. 1. Initial clinical appearance

Figure no. 2. Atraumatic extraction of 2.1 (change root)

Figure no. 3. Drilling the neoalveoli

Figure no. 4. Compacting bony walls

Figure no. 5. Manual insertion of the implant

Figure no. 6. Placement of the implant in relation to adjacent teeth

Figure no. 7. Mounting temporary abutment and provisional prosthetic restoration

Figure no. 8. Mounting temporary abutment and provisional prosthetic restoration

Our study compares immediate loading with the initial concept of two-stage procedure. An immediate loading of the implants was made possible through a permanent fixed, rigid superstructure, moving midline (figures no. 1,2,3,4,5,6,7,8).

The etiology of tooth loss has been represented by:

• caries in 35%;

• periodontitis in 65%;

The implants used were:

• SLA surface screw implants;

• hex internal conical connection (Implantium, Korea).

Immediate loading criteria were represented by:

• 40-45Ncm primary stability;

• integral alveola with bone offer of at least 2 mm perimeter;

• bone-implant contact of at least 70%;

• lack of bruxism history;

• very good oral hygiene;

• no smoking.

Provisional restorations were mounted three weeks after insertion and the final ones 12 weeks after insertion.

Among the criteria that led to the implant decision, we can mention:

• lack of mobility of adjacent teeth;

• absence of bruxism;

• posterior occlusion to be balanced and the bone is not of type 4;

• good oral hygiene;

• no smoking.

The results showed a success rate of 99.8%. In all cases, primary stability was achieved. It is recommended to carefully analyze the cancellous bone before insertion, using osteotomes for bone condensation and limiting milling.

Conclusions:

It is recommended to consider the following factors in planning immediate loading:

- the clinician must use a type of bone adaptive technique for surgical preparation of the implant site;
- determining the position and carefully dosing milling, observing the direction required by the implant;
- final cutters must not penetrate up to the depth corresponding to the total length of the implant;
- a clinical assessment of the primary stability of the implant is essential, in order to decide on the possibility of immediate loading.

It is clear now that the texture of the implant surface plays an important part in the healing process, allowing the reduction of this stage. In making the prosthetic superstructure, small amplitude movements should be considered within physiological limits through bilateral immobilization using the tripod principle (at least three non-aligned implants) and eliminating paraxial (side) occlusal forces.

Some contraindications include: inadequate bone quantity / quality and the absence of primary fixation. Estimation should be done by monitoring the torque, periotests or analyzing resonance frequency.

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