

CLINICAL STUDY REGARDING THE IMPORTANCE OF PERIIMPLANTAR TISSUES FROM SINGLE-TOOTH SITE

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Abstract: The predictability of an outcome regarding periimplantar aesthetic depends on the patient's particular anatomy. For stipulating the periimplantar aesthetic outcome with more accuracy, evaluation of the following aspects is needed: form and biotype of the periodontium, coronary design, the integrity of the socket after an extraction and the position of the tooth that needs to be replaced with an implant. Creating an implant restoration with a gingival architecture that harmonizes with the adjacent teeth is a great challenge. The most appropriate situation, with the lowest risk, appears when the affected tooth is positioned more coronally and orally, the gingival architecture is flat, the biotype is thick and the depth of the periimplantar bag is less than 3 mm. In this case, the surgical intervention will be flapless. After losing an anterior tooth, the healed wound will create a less aesthetic soft tissue complex. Often, the alveolar mucosa recedes apically and palatally causing complications by losing the interdental papilla.

INTRODUCTION

Implant site preparation seeks appropriate hard and soft tissues, both quantitatively and qualitatively. This can be achieved by a variety of therapeutic strategies chosen depending on the particular clinical situation.(1)

Single tooth implant prosthetic restoration requires long time maintenance of the periimplantar structures. Patients' expectations are turning more often to aesthetic and bright smile.

Aesthetic of a natural smile or of prosthetic restored arch is the result of the balance between the gingival and dental components and scalloped configuration of the interdental papilla.(2)

Important is caution in the decision of extracting a tooth and inserting an implant, but especially the therapeutic opportunity and the conditioning of this decision. A tooth can be extracted and replaced anytime, extraction being a definitive and irreversible treatment.(3)

If the decision to extract a tooth has been taken, the next step is implant loading. Implants' and new surfaces' design, insertion protocols and temporary restoration are currently applied in the anterior area. Aesthetic aims to maintain periimplantar structures, bone and gingival tissue.(4)

Single tooth prosthetic treatment in aesthetic area treatment will consider:

- Prosthetic construction (abutment-implant connection type, implant placement connections in relation to the edge of crestal bone and with the free gingival margin, the angle of emergence of crown restauration, implant diameter and connection design, and of the abutment)
- The relative position and form of the extracted tooth
- Anatomical periodontal structures as:
 - position of crestal bone;
 - dimensions of certain periodontal structures of the soft tissue:

§ dimensions of gingival sulcus;

§ junctional epithelium;

§ supracrestal connective tissue or connective tissue attachment;

§ interdental papilla.

Often the success in periimplantar aesthetics is not given by the clinician skills, surgical protocol or the modern techniques of prosthetic reconstruction, but by the periodontal anatomical structures existing at the time of the extraction.(5)

Knowing the dimensions of these periodontal anatomical structures and the evaluation of each structure will allow the clinical team to adopt the treatment options, surgical and distinctive restorative techniques for the structural biotype of each tooth regarding functional and a aesthetical result.

Bone structures are those that support and provide red aesthetic for restorations in the anterior area. Evaluation of hard tissue structures before inserting the implant, refers to the shape of teeth, tooth relative position vs. crestal bone, adjacent teeth and analysis of the crestal bone. The anatomy of the dental crown will determine the design and dimension of gingival embrasure.

White aesthetic is determined by the design of tooth's crown: square, round or triangular. Red aesthetic is determined by the interproximal papilla and gingival support especially vestibular.

Large interradicular spaces and triangular crowns increase the risk of appearing the black triangles by positioning the contact point towards the incisal angle. This interdental space will require higher and voluminous interdental papilla.

The same aesthetic problems occur when interdental septum height is lost due to advanced periodontal disease, either as a result of traumatic extraction or neglected old edentulous (figure no. 1).

Aesthetic correction is done by coronal reconstruction techniques with composite or ceramic veneers or by placing an implant with optimum diameter.

Implant dimensions are chosen so as to preserve more than 2 mm for the interproximal bone septum, condition that

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will limit the vertically resorption which may occur after prosthetic loading.

Figure no. 1. Interdental septum height loss which affects aesthetics



“Pinching” the peaks of the interdental septum is due to the size, volume and shape of the papilla with the advent of black spaces (figure no. 2).

Figure no. 2. Pinching the peaks of the interdental septum



Teeth with square shape have roots with a large circumference and thin interdental septum with increased risk of vertical resorption.

Teeth with triangular shape have thin and long roots that allow the existence of well represented osseous septum. The presence of a thicker proximal bone will reduce vertical resorption after extraction or after insertion of implants by preserving the lateral dimension of biological interdental space.

At the time of implant crown reconstruction must be identified relationships between:

- coronal part placed 3 mm subgingival which will be a replica of the extracted tooth root;
- the visible coronal part of the tooth crown will take the form of the extracted tooth and will be identical to the contralateral natural tooth.

A balance between the size of the abutment / implant connection and the interproximal coronal sizes provides the gingival support design, turning into a conformer for the interdental papilla and free gingival margin.

The size of the implant in the anterior area is not to fill the socket but to ensure a space of 2 mm between adjacent tooth neck and implant, so we prefer small diameter implants between 3.4 and 3.6 mm.

Vertically, the implant's plate is placed 3 mm below the interproximal crestal bone with an emergence interproximal profile straight to the coronal area of the proximal crestal bone.

Assessment of alveolar crest level and position is a predictability factor for gingival health and design so,

measurements made between the free gingival margin and alveolar crest can highlight three situations:

- crestal bone in normal position (3mm);
- crestal bone in apical position (more than 3 mm);
- crestal bone in coronal position (less than 3 mm).

Both ends are unfavorable. A gingival sulcus greater than 3 mm leads to bone resorption after implant insertion with inflammation caused by anaerobic flora and lack of mechanical control (cement retention) and the impossibility of sanitation.

Slight early bone loss is up to 1 mm immediately after the extraction and insertion of the implant (figures no. 3,4,5,6).

Figures no. 3 and 4. Tooth extraction and immediately implant insertion after extraction with abutment positioning



Figures no. 5, 6. Removing healing abutment and provisional crown mounting in the second day after the surgery



It is recommended to measure the distance from the free gingival margin to the crestal bone which, normally, consists of the conjunctival attachment height (about 1 mm), epithelial attachment (about 0.80 mm) and gingival sulcus (about 1.2 mm). When the distance is greater than 3 mm, to avoid post-implantation bone resorption, coronary orthodontic elongation is practiced.

Interproximal measurements of proximal gingival sulcus may be of 4 mm and more than 4 mm without presenting any post-implantar risk. Please note that measurements only highlight the coronal part of the crestal bone of the teeth that limits the edentulous space. These measurements do not refer to the interproximal position of the osseous septum next to the edentulous space. If you have a low crestal bone on the adjacent tooth with gingival sulcus over 4 mm, after tooth extraction is possible to have a loss of interproximal soft tissue greater than 3 mm.

Another component of preextractional diagnosis is to assess the damaged tooth in relation with adjacent teeth and the colateral tooth. Changing the position of the tooth by a poor implant-prosthetic construction will reflect changes such as bone resorption and changing the gingival design. The damaged tooth is evaluated in three ways:

- in mesio-distal assessment is considered the proximity to adjacent tooth for identifying the proximal bone ratio of the interdental papilla and the axis of the tooth.

An anterior tooth oriented mesially creates an incisal contact point and a wider embrasure with large areas that require

the presence of a voluminous papilla.

Mesial inclination, by its wide spaces, is based on large osseous septum with a lower postextractional resorption risk - phenomenon met in case of diastemas.

An unfavourable site is when teeth show large roots with thin interdental septum and a high risk of resorption after extraction. Thin interproximal bone creates a high risk of lateral resorption with fast decreasing of the vertical height even if the insertion of the implant is done immediately after extraction.

Before extraction, an optimal situation is when the interproximal bone width is at least 1.5 mm from the tip of the osseous septum in order to minimize side and further resorption caused by lateral damage of the biological width after the implantar restoration.(6)

Vertically, the tooth neck's position can be higher, lower (coronary) or in optimal position and follows the design of the free gingival margin.

After extraction, the vertically lose will be 2 mm and the gingiva will recede following the crestal bone when edentulous area is protected with body bridge. When implant insertion with immediate prosthetic occurs after extraction, resorption is reduced to 1 mm.

For implant-prosthetic restorations in the frontal area, the most common complication is gingival resorption with altered aesthetics. Coronal positioning by orthodontic extrusion with 1-2 mm is the most predictable solution.

Vestibulo-oral problems occur when the tooth is placed vestibular and the vestibular cortical and is very thin (less than 1 mm). Compromised teeth in vestibular postextractional position will have a significant vertical loss and pronounced vestibular cortical depression. In such cases, surgical protocols will include augmentation techniques before and after tooth extraction.

Palatal position of the front teeth presents a thick vestibular cortical and generous soft tissue and after extraction, the resorption is less aggressive.

Success in implant restoration for anterior area is ensured by the maintenance of the structures and soft tissue aesthetic, the gingival biotype, the gingival genotype, the free gingival margin design, the profoundness of the interdental papilla in the periodontal sulcus.

Because of the bone erosion, periimplantar soft tissue loses support, leading to gum problems and aesthetic default. Scalloped gingiva formation may be high, normal or flat.

A study regarding the periodontal form shows that the scalloped gingiva has the papilla tip placed at 5 mm incisially form the free gingival margin, and if central incisor is 10 mm height the soft tissue will occupy half of the vestibular visible area.(7)

For single tooth implant is important to identify the cemento-enamel junction as the crestal bone that supports a healthy periodontium is 2 mm away and follows the design of the scalloped gingiva. The presence of a well represented papilla (4 mm) and a high normal scalloped gingiva limits soft tissue and gingival design loss after tooth extraction.

The existence of the papilla between the tooth and the implant is determined by the contact point distance between the bone and the alveolar crest and the distance between the cemento-enamel limit and crestal bone.

A flat design of the scalloped gingiva is given by the hard support with flat scalloped bone and it creates an increased predictability in terms of maintaining interdental papilla with this aspect.

For the anterior area, a thick biotype of the vestibular gingiva is favourable to the aesthetics because it is more resistant to resorption, less transparent and the well represented

fibroperiost allows greater blood supply which is essential for regeneration and for guided bone augmentation.

For patients with thin biotype, any protocol which implies the removal of a tooth will cause a vertical resorption phenomenon of the crestal bone and the interdental septum resorption especially the vestibular cortical. Inserting implants immediately after extraction with a flapless technique is less invasive and is recommended when we have thin gingiva because it decreases the resorption risk and minimizes the compromising of the blood supply.(7)

CONCLUSIONS

In most cases, patients present one or more positive diagnoses mixed with one or more negative diagnoses. The ideal situation with the lowest risk occurs when the tooth crown is placed 1-2 mm coronally and palatally with flat design of the scalloped gingiva, a thick and dense biotype, a square tooth and a high crestal bone placed at a vertical distance of less than 3 mm. Flapless surgical procedure has the same success rate in relation to the flapped technique. Unfavourable situations are generated by thin and transparent gingival biotype and triangular teeth which generate black triangles, high papilla but not supported by interdental bone septum and vestibularized position of the tooth. Aesthetics is performed by postextractional subcrestal placing of the implant and the healing using a small gingival conformer in the anterior area stabilizes the soft tissues.

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