
SURGICAL MANIPULATION OF SOFT AND BONE TISSUE IN CONTEMPORARY DENTAL IMPLANTOLOGY

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Abstract: Adequate and correct manipulation of soft and bone tissues during implant therapy is extremely important. Knowledge of the biological, histological and of course the surgical characteristics of the tissues can largely be a predictor of the correct implant prosthetic rehabilitation. The main aim of this research was to describe all aspects of surgical manipulation of the soft and bone tissues during the dental implantology procedures. We have made adequate literature research for articles relevant to our topic-surgical manipulation of the soft and hard tissues during the dental implantology procedures published in the last two decades (2001-2021). Kew words used for the research were: “surgical manipulation”, “dental implantology”, “soft tissues”, “bone tissues” and their combination. Each implantologist should take into account the biological limitations of each patient, as well as the technical limitations that may occur during the treatment. Oral soft tissues can be affected during the various stages of the implant treatment. During the planning of a surgical intervention such as the placement of an implant, regardless of whether it is an immediate or a delayed loading implant, it is necessary to have an adequate manipulation of the surrounding soft tissue and bone structures. When designing the flap should be taken into account the degree of accessibility required to access the bone, as well as the final position of the flap. It is also of great importance to take into account the preservation of good blood supply to the flap. Based on the exposure of bone after elevation, flaps can be classified as either full-thickness or mucoperiosteal flaps and partial-thickness or mucosal flaps. Depending on how the interdental papilla will be treated, the incisions can either divide the papilla (conventional incision) or preserve it (papilla-preserving incision). Based on the placement of flaps after surgery, they can be classified as: 1) nondisplaced flaps, where the flap is returned and sutured to its original position, or 2) displaced flaps, which are placed apically, coronally, or laterally from their original position. The work in bone is quite complex and requires knowledge of its morphological and histological characteristics. When working on bone, and especially when placing dental implants, it is necessary to note that it is necessary to enable constant cooling. The improvement of old techniques and the development of new technologies have created a revolution in oral implantology, and now a therapist has numerous therapeutic options that can be incorporated into daily practice to facilitate the surgical approach itself. Hard-tissue and soft-tissue dental lasers, which are constantly improving and have a wide range of indications, are becoming a part of everyday dental practice and also show significant advantages compared to conventional instruments and techniques when placing dental implants. Therefore, over time they will become an invaluable and irreplaceable tool in modern dental implantology. After the performed extensive and deductive literature review, it can be concluded that from particular importance is the correct manipulation of soft and bone tissues during dental implantation. After tooth extraction, the placement of dental implants is largely determined by the integrity of existing hard and soft tissues, such as the aesthetic outcome from the prosthodontic suprastructure over dental implants. Careful assessment of soft and bone tissue loss during implantation is paramount to the success of aesthetic implant procedures.

Keyword: dental implants, soft tissue, hard tissue, surgical interventions

1. INTRODUCTION

Adequate and correct manipulation of soft and bone tissues during implant therapy is extremely important. Knowledge of the biological, histological and of course the surgical characteristics of the tissues can largely be a predictor of the adequate implant prosthetic rehabilitation. Proper planning and management of oral tissues can suppress the occurrence of numerous intra- and postoperative complications and thereby affect the patient's quality of life in the post-operative period. (D'Addona et al, 2012).

The selection of the patient, the serious analysis of the dental and medical history with consideration of the possible general and local factors that may affect the process of osseointegration also has a significant role during the preoperative planning and during the intervention, as well as in the possibility of assessment and prevention of possible complications. (Parithimarkalaignan & Padmanabhan, 2013). It is for this reason the exceptional

importance of taking data from the patient about his general and oral health is emphasized, as well as the assessment of the possibility of their impact on successful implant therapy.

The entire surgical procedure should be planned down to every detail before starting the intervention. This includes: planning of the type of flap, its exact location and type of incisions, bone management and final flap closure and suturing. Although some details can be modified during the performance of the procedure, detailed planning allows for a better clinical outcome. (Al-Juboori, 2016)

The main aim of this research was to describe all aspects of surgical manipulation of the soft and hard tissues during the dental implantology procedures. We have made adequate literature research on Pub Med, as most commonly used internet database, for articles relevant to our topic-surgical manipulation of the soft and hard tissues during the dental implantology procedures published in the last two decades (2001-2021), and the type of articles were Clinical Trial, Journal Article, Randomized Controlled Trial, Review, Comparative study and English was chosen as the language and humans as the species. Key words used for the research were: “surgical manipulation”, “dental implantology”, “soft tissues”, “hard tissues” and their combination.

2. SURGICAL MANIPULATION OF SOFT AND BONE TISSUE IN DENTAL IMPLANTOLOGY

In modern implantology, various surgical and prosthetic options are available, which together with biological factors can ensure a good aesthetic result and long-term stability of the peri-implant tissues. In the preoperative evaluation of the patients, special attention should be directed to the patient's smile, in which anatomical limitations may appear in many cases, and of course to the knowledge needed to choose the ideal intervention. Each implantologist should take into account the biological limitations of each patient, as well as the technical limitations that may occur during the treatment. Oral soft tissues can be affected during the various stages of the implant treatment. (Velvart & Peters, 2005)

Soft tissue management techniques during implant therapy consist of the use of free gingival grafts, coronally positioned flaps, various types of gingival grafts, free connective tissue grafts, procedures for tissue guided regeneration and guided tissue augmentation. (Kassab, 2010)

During the planning of a surgical intervention such as the placement of an implant, regardless of whether it is an immediate or a delayed loading implant, it is necessary to have an adequate manipulation of the surrounding soft tissue and bone structures. (Mittal et al, 2016) Therefore, special attention in the pre-operative period should be directed to the following steps:

- mucoperiosteal and mucosal flap planning,
- adequate work in bone,
- hemorrhage control and
- wound healing (Annibali et al, 2008)

During the formation of the mucosal or mucoperiosteal flap, special attention should be paid to the initial incision. The initial incision is made with a sharp scalpel and firm pressure in one stroke at right angles to the bone. If this move is uneven, the edges of the incision will be irregular or scratched, and if the angle is obtuse, we will have inadequate suturing as well as improper healing. (Pippi, 2017). During this procedure, only the mucosa is cut, possibly with a thin layer of submucosa. The length and shape of the incision depend on the type of intervention and of course on the number of planned implants to be placed. (Kleinheinz et al, 2005)

When planning the incisions for the formation of a mucoperiosteal flap, care must be taken not to injure the surrounding neurovascular structures. Therefore, it is best to make such an incision on the outer side of the maxilla and the entire periosteum of the palate as well as the buccal and lingual side of the mandible. (Iwanaga et al, 2020). It is of particular importance to mention that when the mucoperiosteal flap is planned around existing teeth, it is most suitable for the incision to be in the length of the gingival sulcus. (MNHTPKF, 2014). When planning the size of the flap, the incision in the anteroposterior direction must be bigger from the future osseous defect to allow adequate healing. And perhaps what is most important is that the flap has to have an adequate size to ensure good visualization of the operative field and adequate surgical accessibility to the intervention zone.

For faster healing of the wound, it is necessary to take into account the fact that during the intervention plan, the flap itself needs to have a larger blood vessel that will allow adequate blood perfusion of the tissue in the postoperative period. (Guo & Dipietro, 2010).

Surgical flaps can be classified based on the following criteria:

- Bone exposure after flap elevation
- Management of interdental papillae
- Placement of the flap after the surgical procedure (MNHTPKF, 2014)

Flap design predominantly depends on the surgical judgment of the operator and the goals of the operation. When designing the flap be taken into account the degree of accessibility required to access the bone, as well as the final

position of the blade. As aforementioned, it is also of great importance to take into account the preservation of good blood supply to the flap.

Based on the exposure of bone after elevation, flaps can be classified as either full-thickness or mucoperiosteal flaps and partial-thickness or mucosal flaps. In full-thickness flaps, all of the soft tissue, including the periosteum, is elevated to expose the underlying bone. A partial-thickness flaps involves only the epithelium and a layer of connective tissue beneath it. The bone remains covered by a layer of connective tissue, including the periosteum. This type of flap is also called a partial-thickness flap. (Velvart et al, 2003)

There are conflicting data regarding the advisability of exposing the bone when it is not really necessary. When the periosteum is separated from the bone, there is resorption at the edge of the alveolar process and loss of a certain amount of bone tissue. This loss is prevented when the periosteum is left on the bone. However, recent scientific research suggests that the differences are usually not clinically significant. Also, the periosteum that remains on the bone can be used to suture the cut when it is placed apically.

In context of the preservation of the interdental papilla and its inclusion in surgical flaps, two basic designs of flaps are used. Depending on how the interdental papilla will be treated, the incisions can either divide the papilla (conventional incision) or preserve it (papilla-preserving incision). (Moreno-Rodríguez & Ortiz-Ruiz, 2021) In the conventional flap, the interdental papilla is divided below the point of contact between two adjacent teeth to allow elevation of the vestibular and lingual ridges. The incision usually follows the contour of the gingival margin to preserve the gingival morphology with as many papillae as possible. The conventional flap is used when 1) the interdental spaces are too narrow, making it impossible to preserve the papillae, and 2) when the flap needs to be elevated. The papilla-preserving flap incorporates the entire interdental papilla into one of the incision using cervical interdental incisions, to separate the connective tissue attachment, and a horizontal incision at the base of the papilla, leaving the papilla attached to one of the tooth. (Pei, 2021).

Based on the placement of flaps after surgery, they can be classified as: 1) nondisplaced flaps, where the flap is returned and sutured to its original position, or 2) displaced flaps, which are placed apically, coronally, or laterally from their original position. Both full-thickness and partial-thickness incisors can be moved, but to do so, the attached gingiva must be completely separated from the underlying bone, allowing the unattached portion of the gingiva to be movable. (De Sanctis & Clementini, 2014).

When planning the surgical intervention, it is necessary to pay attention to the following principles of manipulation with soft and bone tissues:

- To avoid a vertical incision in the aesthetic zone. Vertical incisions create tissue defects due to the lack of elastic fibers and never heal like the surrounding structures
- It is necessary to choose grafting techniques that are minimally invasive, that require fewer surgical sessions and provide the best aesthetic effect
- For the best manipulation of soft tissues, it is preferable to use modern grafting techniques such as the tunnel technique or the envelope method
- Suturing techniques and suturing materials are extremely important because atraumatic suturing is possible, which results in a better healing process of the surgical wound itself. (Yadav et al, 2015).

And finally, it is most important to assess where the adequate incision should be placed, taking into account the overall anatomy of the face, head and neck.

When placing the dental implants, it is necessary to pay attention to the bone structures too. Namely, the positioning of the implant is accompanied by the removal of part of the alveolar bone. The removal of parts of the bone in oral surgery can also be done in order to:

- Enable access to any pathological lesion
- Enable access to an impacted tooth
- Provide space for placing the necessary instruments
- Provide enough free space to perform the intervention
- Removal of changed parts of the bone called sequestrations
- Perform deformation correction
- Perform adequate treatment of the wound after completed surgical intervention (removal of sharp bone edges). (Goyal & Iyer, 2009; Rodriguez et al, 2015).

The work in bone is quite complex and requires knowledge of its morphological and histological characteristics. When working on bone, and especially when placing dental implants, it is necessary to note that it is necessary to enable constant cooling. Namely due to the use of rotator movements during the creation of the dental implant bed, there is an increase in the temperature of the bone structures. Cooling is necessary to prevent side effects that may occur on the bone due to increased temperature. (Stocchero et al, 2019).

Minimally invasive procedures have become a new paradigm in dental medicine. The main thought and concept of this approach is tissue preservation, which implies carrying out the procedure in a way that will lead to the least damage to the surrounding tissue structures on the one hand and the most precise on the other hand . (Mm et al, 2014). The improvement of old techniques and the development of new technologies have created a revolution in oral implantology, and now a therapist has numerous therapeutic options that can be incorporated into daily practice to facilitate the surgical approach itself.

Hard-tissue and soft-tissue dental lasers, which are constantly improving and have a wide range of indications, are becoming a part of everyday dental practice and also show significant advantages compared to conventional instruments and techniques when placing dental implants. Therefore, over time they will become an invaluable and irreplaceable tool in modern dental implantology. Means of visual magnification, such as the operating microscope, provide a high degree of precision and improvement of motor skills by the therapist, resulting in better clinical results and less trauma for the patient. It can be concluded that very likely in the future minimal invasiveness will become the standard in all branches of dentistry. (Papakoca & Petrovski, 2021a; Papakoca & Petrovski, 2021b).

3. CONCLUSION

After the performed extensive and deductive literature review, it can be concluded that from particular importance is the correct manipulation of soft and bone tissues during dental implantation. After tooth extraction, the placement of dental implants is largely determined by the integrity of existing hard and soft tissues, such as the aesthetic outcome from the prosthodontic suprastructure over dental implants. Careful assessment of soft and bone tissue loss during implantation is paramount to the success of aesthetic implant procedures.

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