

# The 2<sup>nd</sup> Baltic Osseointegration Academy and Lithuanian University of Health Sciences Consensus Conference 2019. Summary and Consensus Statements: Group I - Biological Aspects of Tooth Extraction, Socket Healing and Indications for Socket Preservation

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## ABSTRACT

**Introduction:** The task of Group I was to review and update the existing data concerning the physiologic process of socket healing, in the absence or presence of grafting materials or platelet concentrates, addressing the associated molecular and cellular events that culminate in the restoration of the lost tissue architecture and functionality. The second task was to review current literature concerning extraction socket classification immediately following tooth extraction and the rationales for socket preservation/augmentation procedures and with reference to it suggest novel clinical decision tree for extraction socket preservation/augmentation in aesthetic and non-aesthetic area.

**Material and Methods:** The main areas indicated by this group were as follows: socket healing process, including haemostasis and coagulation, inflammatory phase, proliferative phase, bone tissue modelling and remodelling; socket healing with graft materials and autologous platelet concentrates; extraction socket classifications; indications and reasons for extraction socket preservation/augmentation. The systematic reviews and/or meta-analyses were registered in PROSPERO, an international prospective register of systematic reviews: <http://www.crd.york.ac.uk/PROSPERO/>. The literature in the corresponding areas of interest was screened and reported following the PRISMA (Preferred Reporting Item for Systematic Review and Meta-Analysis) Statement: <http://www.prisma-statement.org/>. Method of preparation of the systematic reviews, based on comprehensive search strategies, was discussed and standardized. The summary of the materials and methods employed by the authors in preparing the systematic reviews and/or meta-analyses is presented in Preface chapter.

**Results:** The results and conclusions of the review process are presented in the respective papers. One theoretical review-analysis and one systematic review were performed. The group's general commentaries, consensus statements, clinical recommendations and implications for research are presented in this article.

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## RESULTS

The following reviews were prepared for publication as a result of work of Group I:

### **1. Molecular and Cellular Aspects of Socket Healing in the Absence and Presence of Graft Materials and Autologous Platelet Concentrates: a Focused Review (Gomes et al. [1])**

#### *General commentaries*

After tooth extraction, a series of fundamental biologic events occur in the alveolus and surrounding tissues, aiming wound closure and tissue healing. These can be staged into four overlapping phases: coagulation and haemostasis; inflammation; proliferation; and finally, modelling and remodelling; in which distinct molecular and cellular mediators play a fundamental role. The orderly interaction of these cells and mediators conjoins into the healing process, further leading to the loss of volume and shape of the original ridge. This process can be further modulated by the implantation of grafting materials or autologous platelet concentrates, influencing the biologic output.

Due to marked heterogeneity among the included studies in terms of design, quality of reported data, varying outcomes and amplitude of the topic addressed, no meta-analysis could be performed.

#### *Consensus statement*

The physiological process of socket healing, embracing a complex network of molecular and cellular elements converging to tissue healing, leads to volume and shape alterations of the original ridge. The use of grafting materials or autologous platelet concentrates seems to affect the biological functionality of the socket healing dynamics, influencing cell functionality and tissue organization. A greater understanding of the cellular and molecular aspects of the healing process is necessary to improve clinical treatment outcomes and assist in the development of innovative biologically-based regenerative approaches for improved healing outcomes.

#### *Clinical recommendations*

Socket healing originates qualitative and quantitative physiological alterations in the socket structure, which results in the reduction of the bone crest dimensions.

The variation of post extraction dimensional alterations seems to be related to local, individual and surgery-related variables and cannot be eliminated completely.

Socket grafting seems to be effective for limiting the attained physiological reductions, as compared to ungrafted socket healing.

Autologous platelet concentrates seem to improve socket soft tissue healing and exhibit osteopromotive properties on bone healing, either alone, or in combination with graft materials.

#### *Implications for research*

Additional studies are needed, particularly within a clinical setting, in order to further disclose molecular and cellular events of the socket healing process. Effort should be conducted to homogenize procedures and data analysis regarding variables, outcomes and time points. A substantial body of evidence needs to be available to guide clinicians in making evidence-based decisions.

### **2. Morphological Classification of Extraction Sockets and Clinical Decision Tree for Socket Preservation/Augmentation after Tooth Extraction: a Systematic Review (Juodzbaly et al. [2])**

#### *General commentaries*

Expected horizontal and vertical bone loss after six months following the tooth extraction are 29 - 63% and 11 - 22% respectively. Furthermore, traumatizing of extraction socket bony walls during extraction or by some pathological conditions, can also evoke adverse dimensional changes. Bone loss after tooth extraction may lead to two main challenging situations: it can create an aesthetic problem around the fixed dental prosthesis resulting in soft tissue recession, or it can make the application of dental implant more challenging requiring guided bone regeneration (GBR). Whereas post extraction residual hard and soft tissue morphology plays a crucial role in aesthetic and functional outcomes of the future implant therapy, worldwide overview to extraction socket classification system allows clinicians to ease communication and data collection, which may lead to development of more predictable treatment modalities or to establish the most appropriate treatment plan after tooth extraction.

Study revealed that although there are various types of extraction socket classifications none of them could completely evaluate all morphological parameters of alveolar ridge. Furthermore, it was shown,

**Table 1.** The clinical decision tree for extraction socket preservation/augmentation

| Indications and reasons for extraction socket preservation/augmentation                    | Aesthetic zone  | Non aesthetic zone  |
|--|---|---|
| <b>Aesthetic</b>   |   |   |
| Impossible to reach sufficient aesthetic result  | Facial soft tissue deficiency of extraction socket  |   |
|  | Absence of buccal wall of extraction socket > 50%   | Absence of buccal wall of extraction socket   |
|  | Horizontal bone loss > 2 mm   | Horizontal bone loss > 3 mm   |
| <b>Functional</b>  |   |   |
| Impossible to gain implant primary stability   | Available bone beyond the apex of extraction socket < 3 mm and absence of implant to bony walls contact | Available bone beyond the apex of extraction socket < 3 mm and absence of septal bone |
| <b>Risk related</b>  |   |   |
| Risk of significant alveolar bone resorption   | Multiple extractions when buccal extraction socket wall thickness < 2 mm and thin (< 1 mm) biotype      |   |
|  | Postponed or not recommended implantation for some reasons  |   |
| Risk of apical peri-implantitis development  | Presence of extraction socket bone lesions > 5 mm   |   |
| Risk of maxillary sinus perforation and reducing the need for elevation of the sinus floor | Presence of roots penetrating into maxillary sinus  |   |
| Risk of nasal floor perforation and reducing the need for elevation of the nasal floor     | Presence maxillary alveolar process atrophy in nasal floor projection                                   |   |

that indications for extraction socket preservation have wider spectrum than socket morphology and are related to surrounding tissue anatomy or dental implantation operation indications and timing.

**Consensus statement**

Taking on account results of analysis of extraction socket classifications and rationales for alveolar ridge preservation authors suggested a decision tree for extraction socket augmentation/preservation immediately after tooth extraction in aesthetic and non-aesthetic zones (Table 1). The proposed indications help to determine the need of extraction socket preservation/augmentation from the aesthetic, functional and risk-related viewpoint.

**Clinical recommendations**

Indications and reasons for extraction socket preservation/augmentation should be subclassified to aesthetic, when impossible to reach sufficient aesthetic result; functional, when impossible to gain implant primary stability; and risk related, when there is possibility of significant alveolar bone resorption, apical peri-implantitis development, and maxillary sinus perforation or possibility to reduce need for elevation of the sinus floor. Different parameters should be determined for aesthetic and non-aesthetic zones.

Thorough clinical and radiographic evaluation of extraction socket immediately after tooth extraction should be performed.

Based on current evidence, extraction socket preservation/augmentation is suggested not only in clinical cases with dental implants being planned but also to preserve alveolar bone for removable prosthesis fixation or to support soft tissue around fixed dental prosthesis.

**Implications for research**

Detailed literature search showed very little existing accurate knowledge about the indications for extraction socket preservation.

Further studies are needed to validate the reliability of proposed clinical decision tree for extraction socket augmentation.

**DISCLOSURE STATEMENTS**

All group members were asked to sign a Panel Member Agreement (PMA). This agreement requires individuals to maintain the highest level of integrity and avoid all actual, perceived, and potential conflicts of interest. The authors reported no conflicts of interest related to this study.

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