

# Group D

## Consensus Report

### Implants - Peri-implant (hard and soft tissue) interactions in health and disease: The impact of explosion of implant manufacturers

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#### Introduction

This workgroup met with the objective to address the key events in the establishment and maintenance of the soft and hard tissues during osseointegration, and how implant characteristics can influence these events. In addition, implant-related factors that may affect the etiology, progression and treatment of peri-implant disease were discussed.

The initial discussion focused on clarifying definitions relating to peri-implant health and disease. Following this the group considered and discussed the conclusions pre-

sented in the initiator's review paper. From this paper four key questions were identified for discussion, and recommendations were made. The key questions were:

1. What are the implant-related factors that are important for hard tissue integration?
2. What are the implant-related factors that are important for soft tissue integration?
3. What is the recommended supportive therapy for patients with implant-supported prostheses?
4. Is there a long-term predictable treatment that can be recommended for peri-implantitis?

#### Definitions

The definition of peri-implant disease (both peri-implant mucositis and peri-implantitis) as defined by the 6<sup>th</sup> European Workshop on Periodontology was accepted and used

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to determine consensus on the management of these two conditions. It was determined that the literature provides good evidence to support the concept that even though dental plaque is important for the development of both peri-implant mucositis and peri-implantitis, these conditions are of multi-factorial etiology and may be influenced by poor integrity of the abutment/implant connection. Other iatrogenic factors such as excessive cement are also important contributors in the development of peri-implant disease.

### *Osseointegration*

A direct, structural and functional connection between ordered, living bone and the surface of a load-carrying implant' (Listgarten *et al.*, 1991).

### *Peri-implant disease*

A collective term for inflammatory reactions in the tissues surrounding an implant.

### *Peri-implant mucositis*

The presence of inflammation in the mucosa at an implant with no signs of loss of supporting bone.

### *Peri-implantitis*

An inflammatory process around an implant, characterized by soft tissue inflammation and loss of supporting bone (Lindhe and Meyle, 2008; Zitzmann and Berglundh, 2008).

### **Question 1. What are the implant-related factors that are important for hard tissue integration?**

It was recognised that there are a number of implant-, patient- (systemic health, oral hygiene and pre-existing periodontal disease) and operator-related factors that can influence the integration of dental implants into both hard and soft tissues. Accordingly, dentists should be appropriately trained to understand the importance of these factors and their roles in establishing and maintaining peri-implant health. For the purposes of this discussion other factors related to implant success, including prosthetic design and occlusal loading, were not included.

With regard to implant design it was determined that there is abundant and consistent long-term high level evidence to support the use of threaded, solid screw-type implants manufactured from commercially pure type IV titanium. There is sufficient evidence to confirm good stability and long-term success of implants if they have a length of  $\geq 6$  mm and a diameter of  $\geq 3$  mm. Furthermore, there is good evidence demonstrating that implants with moderately rough surfaces provide advantages over machined surfaces in terms of the speed and extent of osseointegration. While both minimally and moderately rough surfaces are supported by long-term data, moderately rough surfaces provide superior outcomes.

Long-term data indicate that moderately rough surfaces provide superior outcomes in compromised sites, such as the posterior maxilla.

There is emerging evidence to indicate that horizontal offset of the implant to abutment junction (platform switch, platform shift) may offer benefits in reducing marginal bone loss as compared to platform matched implant abutment junctions.

### **Question 2. What are the implant-related factors that are important for soft tissue integration?**

It is recognized that the integrity of the soft tissue seal (consisting of junctional epithelium and connective tissue adaptation) is crucial for long-term success of dental implants. Crucial to this seal is the formation of the peri-implant biologic width, which is established around the implant at least 4-6 weeks after implant placement. This critical structure must not be impinged upon or disrupted. There is no credible evidence to date indicating that any implant-related factors can improve the soft tissue seal around dental implants.

With regard to implant success it was noted that a critical factor was the integrity of the seal between the abutment and the implant. This seal enables minimization of mechanical and biological complications and at the same time ensures the maintenance of marginal bone levels.

Reasonable evidence is available to indicate that the stability of the connection is maintained better with an internal connection as compared to an external connection. There is evidence demonstrating loosening of abutment screws is greater in those implants with an external connection. If the fixture/abutment is compromised then biological complications are less likely to occur if it is located at the mucosal margin rather than bone level.

Operator-related variables and errors, such as incorrect abutment placement, poor restoration seating and cement remaining at the prosthesis-abutment interface, can all affect the marginal soft tissue integrity.

### **Question 3. What is the recommended supportive therapy for patients with implant-supported prostheses?**

It is recognized that there is a physiological remodeling around dental implants once they are loaded. After this initial remodeling phase the condition stabilizes and provides the baseline level for future assessment of tissue parameters (probing depth and bone levels). Therefore, the aim of supportive implant therapy is to maintain the stability of these parameters in health through the control of peri-implant infection and inflammation. Crucial to this is maintaining a good level of oral hygiene. This can be facilitated by good patient compliance with home care of the implants and remaining dentition and also by good prosthetic design, which allows easy access for oral hygiene regimes. Regular professional maintenance is also required to monitor changes in clinical parameters and patient compliance with home care.

The frequency of maintenance visits will vary depending on the risk profile of the patient, as patient susceptibility is an important factor in the development of peri-implant diseases.

There are several key considerations in the prevention of peri-implant diseases. Good evidence supports the need for the establishment of periodontal health around the remaining teeth prior to implant placement. In addition the evidence is strong supporting the need for good maintenance of periodontal health following implant placement.

**Question 4. Is there a long-term predictable treatment that can be recommended for peri-implantitis?**

There is limited long-term (5 years or more) evidence describing techniques and procedures leading to predictable treatment of peri-implantitis. There is some limited short-term data available supporting the use of combined non-surgical and surgical treatment over non-surgical treatment alone. Evidence to date indicates that no available treatments result in total resolution of the problem of established peri-implantitis.

**Recommendations for future directions of research**

On the basis of currently limited good evidence regarding the management of peri-implant mucositis and peri-implantitis there is need for further ongoing research to help clarify the etiology and management of these conditions. This group identified a number of important areas for future research in the field of peri-implant health and disease:

- Improved understanding of the physiology of the soft tissue around implants in humans.
- Detailed understanding of the role and significance of keratinized tissue around dental implants.
- Determining if there is a critical thickness of marginal tissue for implant success, more complete understanding of the significance and role of the “biologic width,” and further exploration of the nature of soft tissue attachment to titanium alloy and other implant materials.
- Improved understanding of the pathogenesis and epidemiology of peri-implant diseases (mucositis and peri-implantitis).
- Investigating the susceptibility of roughened surface implants with internal versus external abutment connections.
- Establishment of evidence-based protocols for both professional and self-care maintenance of peri-implant health as well as risk assessment of the patient. These should be validated in large-scale practice-based trials.

**References**

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