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## Dental implants – Quo vadis?

### ABSTRACT

The use of osseointegrated implants as a foundation for prosthetic replacement of missing teeth has become widespread over the past several decades. Implant therapy is a common, almost daily practice, and will probably gain in popularity during the next several years. In the near future of implant dentistry, there will be a need for further research to prevent and treat implant failure and complications in order to improve the long-term implant success and eliminate implant-related complications. The goal of our cumulative knowledge from dental implant research is to provide the patient with immediate tooth replacement in the simplest, quickest and most functionally and esthetically predictable way.

**KEYWORDS** Bone augmentation; Immediate implants; Implant failure; Loading; Peri-implant mucositis; Peri-implantitis; Restoration.

### INTRODUCTION

Over the past several decades, the use of osseointegrated implants as a basis for prosthetic replacement of missing teeth has become widespread. Implant therapy is a common, almost daily practice and will gain in popularity in the future. It is considered highly predictable and successful (1), but certain risk factors could predispose individuals to lower success rates (2). Due to its success, there has been growing interest in identifying the factors associated with implant failure.

In the near future, there will be a need for further research related to prevention and treatment of implant failure and complications. This will improve the long-term implant success and eliminate

implant-related complications. The goal of the cumulative knowledge of implant dentistry will be to provide the patient with immediate tooth replacement in the simplest, quickest and most functionally and esthetically predictable way.

### IDENTIFYING FAILING IMPLANT

The success of dental implants is commonly defined by implant survival. Implant failure, however, results from a multi-factorial process. An implant that causes clinical symptoms, such as continuous pain, mobility, etc. is considered faulty. Ongoing marginal bone loss (MBL) could also put implant survival at risk in the long-term (3). Recently, the abundance of data regarding MBL, and a better understanding of bone and soft tissue behavior around the implant neck and body, have shown these criteria to be inaccurate for today's wide variety of implant systems (4). It is essential to identify a failing implant in time to avoid continuous alveolar bone loss which could complicate the option of replacing the failed implant with a new one, as well as impair the esthetic outcome of the area.

In the process of implant failure, identifying time points should be a major research topic.

### DEALING WITH IMPLANT FAILURE

An implant-supported restoration offers predictable treatment for tooth replacement (5-9). Nevertheless, failures that mandate immediate implant removal do occur (6, 10-13), and the consequences jeopardize the clinician's efforts to accomplish satisfactory function and esthetics. For the patient, this usually involves additional expenses and procedures (14). Moreover, cluster behavior can occur in implant failure (13, 15), and dental professionals will have to deal with this and related complications. After implant failure, patients should be provided with a tailor-made treatment plan, be informed regarding all possible treatment modalities, and give their

consent to the most appropriate treatment option for them.

The success of implants to replace failed ones at the exact site has scarcely been reported (16-20), with insufficient evidence-based data regarding failed implant replacement.

It is important to assess the nature of implant failure and to show whether it is implant-related, site-related, patient-related, or most likely, a combination of these factors. Understanding failure will help the clinician to prevent it as well as find suitable solutions following implant failure.

### EARLY AND IMMEDIATE IMPLANTATION AND LOADING

Immediate implant placement and loading are an obvious advantage for many patients. Long-term treatment that involves wearing a temporary prosthesis may be inconvenient and the reason for not choosing implant-supported restorations. The concept of immediate implant placement and loading has become popular because it results in less trauma, reduced overall treatment time, decreased patient anxiety and discomfort, high patient acceptance, and better function and esthetics (21-23). Nonetheless, research in this area is confusing and sometimes contradictory. The generally stipulated necessary healing time before implants can be placed or loaded in the mandible and maxilla has been proposed as a result of clinical observations rather than biological documentation.

Immediate placement and loading protocols are frequently used in implant dentistry, but the prerequisites for achieving good results and the limitations of these protocols are not fully known. Careful patient selection, proper treatment plan, meticulous surgery, and proper prosthetic design are essential for optimal outcomes when adopting this approach. Further research is warranted to determine the most suitable method to deliver functionally and esthetically predictable tooth replacement to patients as soon as possible after tooth loss.

### BONE AUGMENTATION TECHNIQUES

An important prerequisite to predict long-term success for osseointegrated implants is a sufficient volume of healthy bone at recipient sites. However, this is frequently lacking due to trauma, tooth loss, or infectious diseases (e.g., advanced periodontitis). Several different techniques have been developed to reconstruct deficient alveolar ridges to allow dental implant placement in either a simultaneous or staged approach (24), including guided bone regeneration,

distraction osteogenesis, onlay bone grafting, among others.

It should be noted that bone augmentation procedures can fail and that implants placed in these areas do not necessarily have the high long-term survival rates of dental implants placed in pristine sites. A recently published consensus emphasizes the need to answer questions about the long-term performance of implants placed in augmented bone; the clinical performance of implants placed in augmented or pristine sites; and the clinical benefits of bone augmentation with respect to alternative treatments (25).

### PERI-IMPLANT MUCOSITIS AND PERI-IMPLANTITIS

Oral surgeons and periodontists who deal with dental implants will spend most of their time and effort on treatment and prevention of peri-implant mucositis and peri-implantitis.

Peri-implant disease following successful integration of an endosseous implant is the result of an imbalance between bacterial load and host defense, which may affect only the peri-implant mucosa (peri-implant mucositis) or may also involve the supporting bone (peri-implantitis) (26). A correct diagnosis of peri-implant disease is critical for appropriate management, and if undiagnosed, may lead to complete loss of osseointegration and implant loss. According to the classification of periodontal disease, peri-implant disease includes two entities: peri-implant mucositis that corresponds to gingivitis and peri-implantitis that corresponds to periodontitis (26). Unfortunately, our knowledge and understanding of the biology and treatment of peri-implant disease are far behind our knowledge with regards to periodontal disease (27, 28).

Although dental implants have been used as a routine procedure for over 25 years to treat edentulous and partially edentulous patients, the design of clinical studies that evaluate the outcome of peri-implant disease treatment in most cases remains longitudinal in character and includes small patient groups. An epidemiological approach needs to be considered for the purpose of providing sufficient information regarding the prevalence of peri-implant disease.

A study should be done using a cross-sectional design and appropriate study sample size, which would include clinical and radiographic examinations.

Patients should ideally be recruited from private or public dental clinics, rather than university clinics, which will provide information on the "effectiveness" rather than "efficacy" in implant therapy (26).

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