The Accelerated Implant Therapy With Parallel-walled Screw Implants Planning, Surgical and Prosthetic Aspects

Introduction

The classical implant protocol recommending a healing time of three months in the mandible and six months in the maxilla has been developed on the basis of purely empirical data. New treatment concepts, technical innovations, and evidence-based dentistry have required re-evaluation of the initial protocol. The aim of this poster is to define the biological, surgical, and prosthetic parameters for a standard protocol in accelerated implant treatment. A consistent terminology has been established.

Terminology

Classification according to the time of implant placement:
1. Immediate implant placement – implant placement immediately after tooth loss
2. Delayed immediate implant placement – implant placement before bone remodeling, after final prosthesis delivery
3. Late implant placement – implant placement after bone remodeling of the alveolus

Classification according to the mode of healing:
1. Submerged healing – healing under cover mucoperiosteal flap, second surgery required at uncovering of the implant
2. Open surgery – transgingival healing with immediate exposition to the oral cavity.
3. Primary soft tissue healing – soft tissue healing around the implant in the oral cavity without an auxiliary cover flap. It can be either a provisional healing abutment or an open flap access procedure.

Classification of implant protocol according to type and time of prosthetic restoration:
1. Immediate functional loading – function in load bearing within 48 hours after implant placement with temporary熙 provisional, in occlusion
2. Non-functional loading – prosthetic restoration within 48 hours after implant placement with provisional熙, out of occlusion
3. Early loading – prosthetic restoration within 3 weeks after implant placement with final prosthetic restoration, in occlusion
4. Advanced early loading – prosthetic restoration within 10 weeks after implant placement with temporary熙, in occlusion
5. Progressive loading – stepwise increased loading due to primary restoration with a temporary熙 final restoration after functional bone remodeling.

The terminology covers the various aspects of a treatment protocol taking into consideration the time of implant placement, healing and prosthetics delivery. It is based on patient-specific, individual treatment concepts.

Anatomy

Over the past 25 years, scientific research and clinical studies combined with improved techniques have provided new data on the biological and physiological processes related to implant placement. A dynamic equilibrium between tissue growth and resorption of the peri-implant hard and soft tissue starts immediately as soon as implant-prosthetic load distribution is initiated. Basically, the integration at the bone-implant interface is a dynamic process. Primary implant stability is directly dependent on direct bone growth on the implant surface. This process can be divided into three stages (Fig. 1).

1. Ossification: Migration of differentiating osteoprogenitor cells into the implant surface along a temporary fibrous matrix. Their attachment is influenced by bone morphology.
2. De-novo bone formation: The osteoblasts deliver non-collagenous proteins into the extracellular matrix, acting as an interface between the new and the old bone. A bone layer is formed on the implant surface in this matrix due to formation of calcium phosphate nuclei and their crystal growth with simultaneous collagen production and subsequent mineralization.
3. After this layer has formed, the third stage of bone remodeling begins. New bone substitutes are formed on the implant surface, which is based on the principles of de-novo bone synthesis.

It has been demonstrated that implants can be loaded early, or immediately if non-movements of more than 0.5 mm occur within the first 4 months. Implants are osseointegrated after a period of primary stability. The implant is then placed with a definitive abutment for cement or screw-retained crowns. The model has been extensively used for implant planning.

Implant design and surgical concept

High primary stability has to be achieved after implant placement to avoid macro-movements during the healing phase. In addition, fast and safe osseointegration must be reached during the functional loading period. The threads of screw implants should not be fraught with due care and caution of implants in all bone qualities. In order to meet the various requirements of all types of bone, it is recommended to use a uniform thread form for the implants in the maxilla and a square thread for the implants in the mandible. This thread form is designed to promote the osseointegration for the square and cortical sections of the implant site. An intrinsically pre-cutting performance of the threads in the cortical section is therefore guaranteed. All implant placement, a torque of 25 to 30 Ncm should be ensured for sufficient primary stability (Fig. 2). The different qualities of cortical and sponge bone have to be considered. Due to a reduced friction in class D3 and D4, the body density quality can no longer be improved by internal condensation (Fig. 3). Long-term success is not only influenced by bone density and implant macro-design, but also by the implant surface. The surface morphology, roughness, and topography of the implant play an important role for primary stability and osseointegration.

Pre-requisites for early or immediate function of implants:
- Sufficient number of implants for primary splinting
- Appropriate implant length of minimum 10 mm
- Absolute primary stability of implants at insertion
- Rigid primary splinting of the implants with the superstructure to avoid unwanted macro-movements
- Anterior-posterior implant distribution to avoid rotation

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Summary

The implant treatment concept described by P.O. Ziemer is to immediately load four to eight splinted implants in the symphysis region has been accepted and proven today as a standard protocol.

1. Prosthetic restoration of the edentulous jaw
   - Non-functional immediate loading and splinting of final implants (evenly distributed in the edentulous maxilla or mandible) with a rigid provisional restoration
   - Functional immediate loading and splinting of final implants (evenly distributed in the edentulous maxilla or mandible) with a rigid provisional restoration
   - Functional immediate loading and bar-splinting of implants in the symphysis region with a final restoration

2. Prosthetic restoration of the partially edentulous jaw
   - Non-functional immediate loading (occlusal support through residual teeth) and splinting of minimum two implants with a rigid provisional overdenture in the maxilla or mandible
   - Functional immediate loading and splinting of minimum two implants with a rigid provisional restoration in the maxilla or mandible
   - Functional immediate loading and splinting of minimum two implants with a final superstructure in the maxilla or mandible

3. Prosthetic restoration of the single-tooth implant
   - Non-functional immediate loading (occlusal support through residual teeth) with a provisional restoration in the maxilla or mandible
   - Functional immediate loading and splinting of a single-tooth implant with a rigid provisional restoration in the maxilla or mandible

The implant design and the surgical treatment have to address the anatomical requirements. There is a need for simple and safe system components for all accelerated implant treatment steps, beginning with implant placement, Osseointegration and impression taking up to Temporary and Final prosthetic delivery.

Prosthetics

The treatment concept described by P.O. Ziemer is to immediately load four to eight splinted implants in the symphysis region has been accepted and proven today as a standard protocol.

Pre-requisites for early or immediate function of implants:
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- Appropriate implant length of minimum 10 mm
- Absolute primary stability of implants at insertion
- Rigid, primary splinting of the implants with the superstructure to avoid unwanted macro-movements
- Anterior-posterior implant distribution to avoid rotation

Current prosthetic and laboratory protocols have shown good success rates for immediate function of implants beyond the indication of the edentulous mandible. Three different implant protocols can be distinguished from a prosthetic point of view.

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   - Functional immediate loading and bar-splinting of implants in the symphysis region with a final restoration

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Literature

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