

# Implant loading in the edentulous jaw: When is the right time?

Immediate loading, early or perhaps better conventional loading after three to six months? Working Group 3 at the 4th ITI Consensus Conference analyzed the literature on this topic and ranked the evidence level of various loading protocols.

When is the right time to load an implant in the case of edentulous patients? While most patients prefer the shortest possible treatment times, selecting the right time for loading is a crucial success factor for implant treatment. But determining the right time is a complex task since the quality and predictability of loading protocols is affected by a whole range of factors specific to the patient and the implant. These include, among others, the patient's state of health, periodontal chart, occlusion, implant surface type, shape and size.

Generally accepted, scientifically validated guidelines and recommendations can therefore be an important aid for practitioners. If a treatment or treatment protocol is evidence-based, it is generally safe to assume a good level of predictability in clinical practice.

For this reason, on the basis of current literature on the subject, the evidence from various loading protocols was evaluated at the 4th ITI Consensus Conference 2008. This article presents the findings and recommendations for implants in edentulous jaws. The following three articles of this series examine the results in partially edentulous jaws.

Among the 2371 publications identified in total, 61 articles met the inclusion criteria and were included in the analysis. The publications comprised data from 2278 patients and 9701 implants. The studies were grouped according to the loading protocol (conventional, early or immediate loading) and prosthetic restoration (fixed, removable).

## Analysis and Determining the Level of Evidence

Using several defined key words relevant to implants in edentulous jaws, the ITI consensus group searched various electronic databases for publications published between 1966 and August 2008. The articles found with this method were included in the assessment, provided they described the use of root-shaped implants with rough surfaces and met one of the following inclusion criteria:

- Systematic review of randomized, controlled clinical studies
- Perspective clinical studies measuring the survival rate of implants or prosthetic restorations over at least 12 months.
- Retrospective studies and case studies with at least 10 patients.

The participants of the working group analyzed the studies included in their assessment with respect to the study design, number of patients and homogeneity of the results (variations in the implant survival rate greater or less than 10 %). The various loading protocols were then grouped into one of the following four evidence categories:

- scientifically and clinically validated
- clinically well-documented
- clinically documented
- insufficient clinical documentation

The determination of these categories built the basis for the working group's consensus statements and recommendations.

**Table 1**

Evidence level of loading protocols in edentulous jaws. Conventional loading: 3 to 6 months following implantation, early loading: 48 hours to 3 months after implantation, immediate loading: loading within 48 hours of implantation.

	Removable prosthetics		Fixed prosthetics	
	Maxilla	Mandible	Maxilla	Mandible
Conventional loading	***	****	****	***
Early loading	**	***	**	**
Immediate loading	*	***	***	***
Immediate loading of immediate implants	*	*	**	*

\*\*\*\* Highest level of evidence: scientifically and clinically validated

\*\*\* Clinically well-documented

\*\* Clinically documented

\* Insufficient clinical documentation

## 1. Removable Implant Prostheses

### *Conventional Loading of Implant Overdentures in the Edentulous Mandible*

This protocol entails the insertion of 2 to 4 implants in edentulous mandibles and connection to an overdenture after a healing period of 3 to 6 months. The analyses of the literature showed that this procedure is scientifically and clinically validated and therefore exhibits the highest evidence level. The consensus group completed the assessment on the basis of 10 publications, data from 671 patients and 1396 implants. The mean survival rate of the implants over a period of 1 to 10 years was 97.1 to 100 % in these studies; prosthetic survival was 88 to 100 %. A prospective long-term study showed that two single or two splinted implants were just as effective as four splinted implants.

### *Conventional Loading of Implant Overdentures in the Edentulous Maxilla*

This loading protocol involves the use of 4 to 6 implants, single or splinted with a bar, and restored with an overdenture after a healing period of 3 to 6 months. Since only three publications with 110 patients and 530 implants could be included in the analysis, the level of evidence was somewhat lower than for the mandible: Conventional loading of maxillary implant overdentures is clinically well-documented. The implant survival rate over a period of 1 to 10 years was 94.8 to 97.7 %. Only one of the studies described prosthodontic survival rates: 92.4 % over a period of 3 years. The ITI consensus work group therefore

recommends that further studies be conducted in order to validate the use of freestanding implants supporting maxillary overdentures with or without palatal coverage both scientifically and clinically.

### *Early Loading of Implant Overdentures in the Edentulous Mandible*

This method involves the functional loading of the implant 48 hours at the earliest and 3 months at the latest after implantation. In the four studies analyzed, which covered 68 patients and 136 implants, two implants combined with an overdenture retained by ball anchors or Locators were used in each case. Early loading (1 to 6 weeks) of mandibular implant overdentures is clinically well documented. Implant survival rates over a period of 1 to 2 years range from 97.1 to 100 %, prosthodontic survival rates range from 82.6 to 100 %. The results from the studies showed that two free-standing implants in the anterior mandible are sufficient for this protocol.

### *Early Loading of Implant Overdentures in the Edentulous Maxilla*

This approach describes maxillary implant overdentures that were functionally loaded no earlier than 48 hours after implant placement and no later than 3 months afterward. Implant-prosthetic designs included four to six implants connected by a bar construction and three free-standing implants with single ball or locator attachments. Only two recent studies with a total of 49 patients and 185 rough-surfaced implants described the early loading of implants in the maxilla with

loading varying from 8 to 12 weeks and were included in the assessment. Implant survival rates ranged from 87.2 to 95.6 %. More clinical trials are needed to scientifically and clinically validate the use of free-standing implants to support maxillary overdentures with or without palatal coverage.

#### ***Immediate Loading of Implant Overdentures in the Edentulous Mandible***

This loading protocol involves the prosthetic restoration and functional loading of the implants within 48 hours after placement. This method was comprehensively documented in seven studies with 329 patients and 1161 implants and is therefore considered to be validated both scientifically and clinically. However, the immediate loading of four bar-splinted implants is better documented than cases with fewer than four implants. The survival rate of the implants over a period of 1 to 13 years was 96 to 100 % in the studies, prosthodontic survival rates ranged from 88.3 to 100 %. It did not matter whether two or four implants were used, or whether these were free-standing or splinted.

#### ***Immediate Loading of Implant Overdentures in the Edentulous Maxilla***

This method involves functional loading of the implants with a removable prosthesis within 48 hours after implant placement. Only one publication detailing the results after one year from 12 patients receiving 48 implants could be included in the analysis. Immediate loading of maxillary implant overdentures therefore is clinically insufficiently documented and is therefore not generally recommended.

## **2. Fixed Implant Prosthesis**

#### ***Conventional Loading of Fixed Implant Prosthesis in the Edentulous Mandible***

This protocol involves a fixed reconstruction and functional loading of the implants after a healing period of 3 to 6 months. Four studies with 207 patients and 1254 rough-surfaced implants were included in the assessment. The prosthesis design was full arch, one piece, supported by four to eight implants. The survival rate of the implants over follow-up periods of 3 to 10 years was 97.2 to 98.7 %, and 100 % for the prosthodontics. The protocol was categorized by the ITI consensus work group as having the highest level of evidence, namely "scientifically and clinically validated."

#### ***Conventional Loading of Fixed Implant Prosthesis in the Edentulous Maxilla***

In the four studies included in the analysis, each of the 104 patients received a one piece full-arch implant prosthesis, supported by 4 and 8 implants, after 3 to 6 months. The

survival rate of the 719 rough-surfaced implants in total over a period of 3 to 10 years was 95.5 to 97.9 %, and 96.3 to 100 % for the prosthodontics. Conventional loading of maxillary fixed implant prosthesis was considered by the work group as being scientifically and clinically validated.

#### ***Early Loading of Fixed Implant Prosthesis in the Edentulous Mandible***

This loading protocol describes mandibular fixed implant rehabilitations that are functionally loaded between 48 hours and 3 months after placement. Three studies with 176 patients and 802 rough-surfaced implants were included in the assessment. The implants underwent loading between 1 to 4 weeks after placement. The prosthesis design was full-arch, one piece, on 4 to 5 implants. The survival rate of the implants in these studies ranged from 98.6 to 100 % over a follow-up period of 1 to 3 years, and 97.8 to 100 % for the prosthodontics. The procedure was considered to be clinically documented.

#### ***Early Loading of Fixed Implant Prosthesis in the Edentulous Maxilla***

In this protocol implants have been in occlusal contact no earlier than 48 hours and no later than 3 months after placement. This loading protocol was also considered by the working group as clinically documented. Four studies with 54 patients and 344 rough-surfaced implants were included in the assessment. The full-arch one-piece or segmented prosthesis were attached to between 5 and 8 implants. The implant survival rates over a period of 1 to 3 years were 93.4 to 99 %. Survival rates were not reported.

#### ***Immediate Loading of Fixed Implant Prosthesis in the Edentulous Mandible***

In this protocol a fixed provisional restoration is attached to the implants and placed in occlusal function within 48 hours after implant placement. The seven – mostly prospective – studies described the results from 181 patients and 942 rough-surfaced implants. Prosthesis designs were full-arch one-piece or segmented supported by 4 to 8 implants. The implant survival rates after a follow-up period of 1 to 3 years ranged from 98 to 100 %. The prosthodontic survival rate was 100%. On the basis of its scientific and clinical validation, this loading protocol represents the highest level of evidence.

#### ***Immediate Loading of Fixed Implant Prosthesis in the Edentulous Maxilla***

This loading protocol describes maxillary implants that have been placed in occlusal function via fixed prosthesis no

later than 48 hours after surgery. This loading protocol was also considered by the work group as being scientifically and clinically validated. A total of six studies examined immediate loading within 48 hours in the case of 893 rough-surfaced implants in 153 patients. Prosthesis designs were full-arch one-piece or segmented supported by 4 to 8 implants. The survival rates of the implants over a period of 1 to 3 years ranged from 95.4 to 100 %. Prosthodontic survival rates ranged from 87.5 to 100 %. Interestingly, most of the implant failures were found in the posterior maxilla.

#### ***Immediate Loading of Immediate Implants with Fixed Prostheses in the Edentulous Mandible***

In the case of this loading protocol, implants are inserted into the freshly exposed extraction alveoli and loaded no later than 48 hours after surgery. Because only two retrospective studies with data from 15 patients and 97 immediate implants were included in the assessment, this procedure was considered by the ITI consensus working group as clinically insufficiently documented. The prosthodontic design was full-arch one-piece supported by 4 to 10 implants. Implant survival rates over periods of 1.5 to 2 years ranged from 97.7 to 100 %. The prosthodontic survival rate is 100%.

#### ***Immediate Loading of Immediate Implants with Fixed Prostheses in the Edentulous Maxilla***

This protocol describes maxillary implants that have been inserted immediately into extraction sockets and placed in occlusal function no later than 48 hours with a fixed prosthesis. The protocol was described in four studies with 149 patients receiving 1194 implants. The prosthesis design was full-arch one-piece supported by 6 to 12 implants. Implant survival rates were between 87.5 and 98.4 % over a period of 2 to 5 years. The prosthodontic survival rate, reported in only one study, was 100%. The loading protocol was regarded as being clinically documented.

Anyone who is interested can download the complete original text of the ITI Consensus Paper in English from the ITI website ([www.iti.org](http://www.iti.org)) under "Publications".

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### **Consensus and Clinical Recommendations**

Based on the detailed analysis of the literature, Working Group 3 at the 4th ITI Consensus Conference made the following consensus statements and clinical recommendations for the loading of implants with rough surfaces in edentulous jaws:

- Loading of rough-surface dental implants between 6 and 8 weeks of implant insertion with removable or fixed prostheses in the mandible or with fixed prostheses in the maxilla should be considered as clinically routine for the majority of patients.
- For loading of dental implants with maxillary overdentures for this time frame (6 – 8 weeks), the level of evidence is lower.
- There is currently no evidence available to support loading of dental implants in the edentulous arches between 2 and 6 weeks after implant placement.
- For the edentulous mandible, the literature supports immediate loading of microroughened implants with fixed prostheses or overdentures. This consensus statement is made with the understanding that the treatment is complex.
- Treatment within this time frame, for the above indications, can be considered a valid treatment option for clinicians with the appropriate education, experience, and skill.
- Conventional loading more than 2 months subsequent to implantation is recommended under certain conditions in the edentulous mandible and maxilla, for example ridge augmentation, sinus floor elevation, patients with parafunction, maxillary overdentures, and compromised host status.

In addition, the following consensus statements were made for the edentulous maxilla:

- Literature supports immediate loading of microroughened implants with fixed prostheses. The treatment is complex and can be considered a valid treatment option for clinicians with the appropriate education, experience and skill. In contrast, immediate loading of dental implants with overdenture prostheses in the edentulous maxilla is not adequately documented in the literature.