

# ITI



**Editors:**  
D. Wismeijer, D. Buser, U. Belser

# Treatment Guide



**Authors:**  
D. Morton, J. Ganeles

Volume 2

Loading Protocols  
in Implant Dentistry  
Partially Dentate Patients



**Quintessence Publishing Co, Ltd**  
Berlin, Chicago, London, Tokyo, Barcelona,  
Beijing, Istanbul, Milan, Moscow, New Delhi,  
Paris, Prague, São Paulo, Seoul, Warsaw

# Preface



Implant dentistry is probably the most interesting and dynamic discipline in modern dental science. It has evolved from a trial-and-error field to an evidence-based predictable treatment modality. This has given dentistry a whole new palette of options for patient treatment. The loading protocols advocated in the early years of implant dentistry (3 to 6 months) are now behind us. Due to advances in surgical and prosthetic protocols as well as the innovation of implant surfaces, the conventional healing period before loading has been brought down to 6 weeks or even less. According to the Proceedings of the Third ITI Consensus Conference, published in a special 2004 supplement of JOMI, immediate implant loading is defined as restoring the implant with a provisional or final restoration in occlusal contact within 24 hours. Immediate im-

plant loading, properly carried out, has shortened the transitional period between implant placement and implant restoration immensely. This has many benefits for our patients when we look at total treatment time, the number of clinic visits, comfort during the healing period, and esthetic and phonetic aspects of the implant treatment. At the same conference, early loading was defined as the prosthetic loading or utilization of an implant at any time between immediate and conventional loading, and conventional loading was defined as the restoration and loading of an implant after a healing period of 3 to 6 months. These definitions are likely to be reviewed in the future, as today's evidence-based and improved techniques allow for shorter healing periods to be considered predictable and safe.



Immediate loading always includes an element of risk. As in the ITI Treatment Guide Volume 1, where each patient's esthetic risk profile was presented, in Volume 2 we have chosen to present a treatment risk profile for immediate loading, which will be a great help for clinicians planning cases that involve choices between various implant loading protocols. This risk profile instrument can be used as an indicator to predict the risk involved in not reaching an acceptable result when treating patients following an immediate loading concept. Optimal results in immediate implant loading can only be achieved when following a comprehensive clinical protocol based on science, preoperative diagnosis, treatment planning, and precise management of the patient treatment, and, last but not least, experience. Based on this, we have included the SAC (Straightforward, Advanced, and Complex) classification

for all the patients presented in this volume. The SAC classification, which is based on a series of items that are checked for every patient, gives the dentist insight into the complexity of each individual patient. The SAC classification for implant dentistry, as described in this volume, will soon be published in book form, reflecting the results of a consensus conference organized by the ITI in March 2007.

Supported by the literature, the results of the ITI Consensus Conference, which were published in a special 2004 supplement of the JOMI, and a large variety of clinical cases, this second volume of the ITI Treatment Guide presents comprehensive details on how to treat patients with crowns and fixed dental prostheses on implants following immediate, early, and conventional loading protocols.

Daniel Wismeijer

Daniel Buser

Urs C. Belser

A stylized, handwritten signature in black ink.

Two handwritten signatures in black ink, one for Daniel Buser and one for Urs C. Belser.



# Editors and Authors

## **Editors:**

Urs C. Belser, DMD, Professor  
University of Geneva  
Department of Prosthodontics  
School of Dental Medicine  
Rue Barthélemy-Menn 19, 1211 Genève 4, Switzerland  
E-mail: urs.belser@medecine.unige.ch

Daniel Buser, DMD, Professor  
University of Berne  
Department of Oral Surgery and Stomatology  
School of Dental Medicine  
Freiburgstrasse 7, 3010 Bern, Switzerland  
E-mail: daniel.buser@zmk.unibe.ch

Daniel Wismeijer, DMD, Professor  
Academic Center for Dentistry Amsterdam (ACTA)  
Free University  
Department of Oral Function  
Section of Implantology and Prosthetic Dentistry  
Louwesweg 1, 1066 EA Amsterdam, Netherlands  
E-mail: dwismeij@acta.nl

## **Authors:**

Jeffrey Ganeles, DMD  
Florida Institute for Periodontics & Dental Implants  
3020 North Military Trail, Suite 200  
Boca Raton, FL 33431, USA  
Adjunct Associate Professor  
Nova Southeastern University College  
of Dental Medicine  
Ft. Lauderdale, FL 33328, USA  
E-mail: jganeles@perio-implant.com;

Dean Morton, BDS, MS  
University of Florida, Gainesville  
Center for Implant Dentistry  
Department of Oral and Maxillofacial Surgery  
1600 W Archer Road, D7-6, Gainesville, FL 32610, USA  
E-mail: dmorton@dental.ufl.edu



# Table of Contents

<b>1</b>	<b>Introduction</b> .....	<b>1</b>
	<i>D. Morton</i>	
<b>2</b>	<b>Proceedings of the Third ITI Consensus Conference: Loading Protocols in Implant Dentistry</b> .....	<b>3</b>
<b>2.1</b>	<b>Consensus Statements and Recommended Clinical Procedures Regarding Loading Protocols for Endosseous Dental Implants</b> .....	<b>5</b>
	<i>D. Morton</i>	
2.1.1	Definition of Terms .....	5
2.1.2	Review of Loading Protocols .....	6
2.1.3	Consensus Statements .....	7
2.1.4	Clinical Recommendations .....	9
2.1.5	Conclusions .....	10
<b>2.2</b>	<b>Review of Implant Loading Protocols</b> .....	<b>11</b>
	<i>J. Ganeles</i>	
2.2.1	Original Loading Protocols .....	11
2.2.2	Evolution of Loading Protocols .....	12
2.2.3	Edentulous Mandible .....	12
2.2.4	Edentulous Maxilla .....	13
2.2.5	Single-Tooth Gaps .....	14
2.2.6	Multi-Tooth Gaps .....	15
2.2.7	Conclusions .....	16
<b>3</b>	<b>General Principles for the Pre-Treatment Assessment of and Planning for Partially Dentate Patients Receiving Dental Implants</b> .....	<b>19</b>
	<i>D. Morton, W. C. Martin, D. Buser</i>	
<b>3.1</b>	<b>Summary of Treatment Risk Profile</b> .....	<b>20</b>
<b>3.2</b>	<b>Treatment Regulators and Risk Factors</b> .....	<b>22</b>
<b>3.3</b>	<b>Factors Influencing Decision-Making in Treatment Approaches</b> .....	<b>26</b>
3.3.1	Scientific Documentation .....	26
3.3.2	Benefit for the Patient .....	26
3.3.3	Risk for Complications .....	26
3.3.4	Difficulty Level of the Prosthodontic Treatment .....	27
3.3.5	Cost-Effectiveness .....	27



4 Clinical Case Presentations Based on Different Loading Protocols ..... 29

Posterior Multi-Tooth Gaps and Free-End Situations in the Maxilla or Mandible

4.1 Replacement of Multiple Teeth in a Partially Dentate Posterior Mandible with a Fixed Dental Prosthesis Using an Early Loading Protocol ..... 30  
*Y. Nakajima*

4.2 Replacement of Multiple Teeth in a Partially Dentate Posterior Mandible with a Fixed Dental Prosthesis Using an Early Loading Protocol ..... 35  
*W. C. Martin, J. Ruskin*

4.3 Replacement of Multiple Teeth in a Partially Dentate Posterior Maxilla and Mandible with Fixed Dental Prostheses Using a Conventional Loading Protocol ..... 42  
*G. O. Gallucci*

4.4 Replacement of Multiple Teeth in a Partially Dentate Posterior Maxilla with a Fixed Dental Prosthesis and a Crown Using Conventional Loading Protocols .... 51  
*F. Higginbottom, T. Wilson*

4.5 Replacement of Multiple Teeth in a Partially Dentate Posterior Maxilla with Crowns Using a Conventional Loading Protocol ..... 59  
*G. S. Solnit, M. Kaufman*

4.6 Replacement of Two Teeth in a Partially Dentate Posterior Maxilla with a Fixed Dental Prosthesis Using a Conventional Loading Protocol ..... 63  
*U. Belser, D. Buser*

Single-Tooth Gaps in the Posterior Maxilla or Mandible

4.7 Replacement of a Maxillary Left Second Premolar Using an Immediate Restoration Protocol ..... 68  
*D. Morton, J. Ruskin*

4.8 Replacement of a Maxillary Right First Molar Using an Early Loading Protocol ..... 76  
*B. Schmid*

4.9 Replacement of a Maxillary Right Second Premolar Using an Early Loading Protocol ... 84  
*M. Rocuzzo*

4.10 Replacement of a Maxillary Left First Molar Using an Early Loading Protocol ..... 92  
*D. Buser, C. Hart*



## Single-Tooth Gaps in the Anterior Maxilla

- 4.11 Replacement of a Maxillary Right Central Incisor Using an Immediate Restoration Protocol ..... 97  
*C. Evans, A. Rosenberg*
- 4.12 Replacement of a Maxillary Right Central Incisor Using an Early Loading Protocol .... 104  
*D. Morton, J. Ruskin*
- 4.13 Replacement of a Maxillary Right Central Incisor Using an Early Loading Protocol .... 112  
*J. Ganeles*

## Multi-Tooth Gaps in the Anterior Maxilla

- 4.14 Replacement of the Four Maxillary Incisors with a Fixed Dental Prosthesis Using an Immediate Loading Protocol ..... 120  
*D. Morton, J. Ruskin*
- 4.15 Replacement of the Four Maxillary Incisors with a Fixed Dental Prosthesis Using an Early Loading Protocol ..... 132  
*S. Chen, A. Dickinson*
- 4.16 Replacement of the Four Maxillary Incisors with a Fixed Dental Prosthesis Using a Conventional Loading Protocol ..... 140  
*F. Vailati, U. Belser*

## 5 Conclusions Regarding Loading Decisions for the Partially Dentate Maxilla or Mandible ..... 147 *D. Morton, D. Buser*

- 5.1 Introduction ..... 148
- 5.2 Degree of Treatment Difficulty ..... 149
- 5.3 Conclusions: Loading Protocols for Partially Dentate Patients ..... 159

## 6 Literature/References ..... 161

# Posterior Multi-Tooth Gaps and Free-End Situations in the Maxilla or Mandible

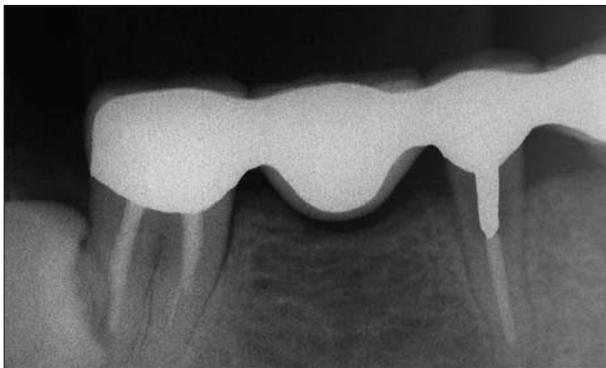


## 4.1 Replacement of Multiple Teeth in a Partially Dentate Posterior Mandible with a Fixed Dental Prosthesis Using an Early Loading Protocol

Y. Nakajima

A 55-year-old female patient was referred for consultation and treatment. Her chief complaint was pain associated with the mandibular right second premolar (tooth 45). The patient denied systemic or oral diseases capable of compromising dental care. She had a history of adult periodontitis, for which she continued to be treated. Her response to therapy and motivation towards dental health were considered excellent.

Intraoral examination revealed a cantilever fixed dental prosthesis in the mandibular right quadrant, with retainers on teeth 45 and 47, and pontics at sites 44 and 46. The retainer on tooth 45 was loose, and the tooth was carious. Radiographic evaluation confirmed the extent of the caries and the maintenance of bone around tooth 45 and in the pontic region 46 (Fig 1).



*Fig 1* Pretreatment radiograph, illustrating the degree of carious destruction involvement on tooth 45 and the bone height around tooth 45 and under the pontic at site 46.

Removal of the fixed dental prosthesis revealed the extent of the destruction of tooth 45, which was considered to be non-restorable (Fig 2).

The patient was given several treatment options. These included:

- Option 1: Bone augmentation at site 44, to be followed by implant placement in sites 44, 45, and 46. This would allow for single-tooth implant-supported crowns in sites 44, 45, and 46, and a metal-ceramic crown on tooth 47.
- Option 2: Bone augmentation at site 44, to be followed by implant placement in sites 44 and 46. This would facilitate restoration with an implant-supported fixed dental prosthesis (44–46), and a metal ceramic crown on tooth 47.



*Fig 2* Pretreatment lateral view subsequent to the removal of the existing fixed dental prosthesis.

- Option 3: Placement of dental implants in sites 45 and 46. This would allow for the fabrication of a fixed dental prosthesis (44–46) with a cantilevered unit (44). A metal-ceramic crown would be provided on tooth 47.
- Option 4: The fabrication of a conventional removable partial denture.

The patient chose not to augment site 44, and she preferred a fixed restoration. After considering all the treatment options, the patient elected and consented to pursue treatment option 3 (two implants and a cantilevered fixed dental prosthesis). Immediate (type 1) implant placement in site 45 was to be undertaken, should hard and soft tissue volume be considered adequate after the extraction of the tooth.

Tooth 45 was extracted with periostomes and elevators without incident. Trauma to surrounding soft tissues and bone was minimized and the site was considered appropriate for the immediate placement of a dental implant. A full thickness mucoperiosteal flap was elevated, and two Straumann Standard Plus implants were positioned in sites 45 (endosteal diameter, 4.1 mm; length, 10 mm; Regular Neck prosthetic platform, 4.8 mm) and 46 (endosteal diameter, 4.8 mm; length, 10 mm; Wide Neck prosthetic platform, 6.5 mm) according to a restoration-driven protocol, using appropriate templates. Both implants were considered stable, and the dimension of the horizontal defect surrounding the implant in site 45 was less than 1 mm (Fig 3).

Healing caps were then positioned to ensure transmucosal healing, and the wound was sutured closed (Fig 4).

After 6 weeks of healing, the patient was evaluated and the soft tissue response was considered excellent (Fig 5).

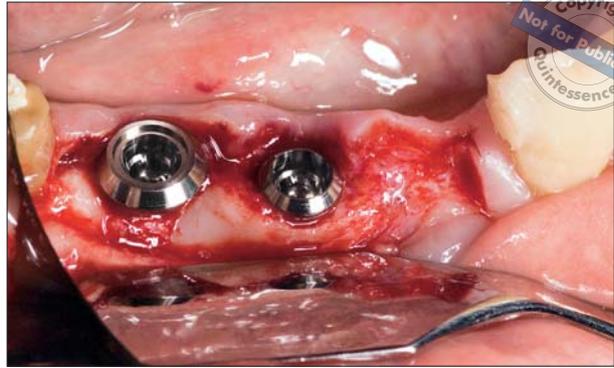


Fig 3 After implant placement. Note the restorative margins at the height of the buccal bone crests and the limited horizontal defect.

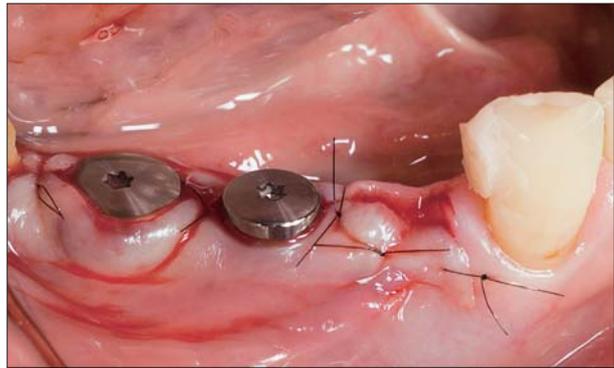


Fig 4 The implants with the healing caps and wound closure.



Fig 5 The healing caps and soft tissue healing 6 weeks after implant placement.



Fig 6 The screw-retained provisional fixed dental prosthesis.



Fig 7 The screw-retained provisional fixed dental prosthesis 6 weeks after placement.



Fig 8 Soft-tissue condition after 6 weeks of provisional restoration.



Fig 9 The customized screw-retained synOcta impression cap and duplicated ovate pontic.

The healing caps were removed, and the sulcus depth on both implants was considered to be less than 3 mm in all areas. Impression caps were positioned to allow for the registration of the implant shoulders, and appropriate positioning cylinders were then placed without incident. A polyvinyl siloxane impression was made to facilitate the indirect fabrication of the provisional restoration. The screw-retained provisional restoration was fabricated in acrylic resin incorporating titanium provisional cylinders for bridges, and it was delivered 8 weeks after implant placement without incident (Fig 6). The cantilevered unit was kept out of occlusion in centric relation and all excursions. Transient blanching (less than 10 minutes) was observed in the region of the ovate pontic.

The soft tissues adjacent to the provisional restoration were allowed to mature for an additional 6 weeks (Fig 7). The health of all tissues was confirmed subsequent to removal of the provisional restoration (Fig 8).

A customized impression cap, duplicating the emergence of the restoration at site 45, and the ovate site 44, was then fabricated (Fig 9) and positioned (Fig 10). A final impression was then taken in polyvinyl siloxane and a cast poured.

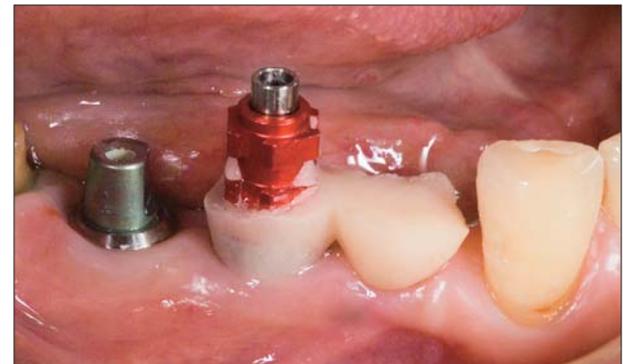


Fig 10 The customized impression cap in position.

For patients receiving implants in the anterior maxilla, there is a greater demand on accurate three-dimensional, restoration-driven implant placement, often in conjunction with hard and soft tissue augmentation procedures (Figs 5 – 10).

The replacement of adjacent missing teeth in the anterior maxilla presents a far greater challenge (Table 4). The response of the supporting hard and soft tissues to the implant position and restorative method is unpredictable,

and the risk to the esthetic outcome is magnified. As most patients in this category are interested primarily in a pleasing esthetic outcome, the esthetic risk is almost always increased; these cases should be considered complex, irrespective of the loading methodology. Clinicians should be mindful of misinformation associated with loading protocols, particularly immediate loading, for patients with extended edentulous spaces in the esthetic zone. Treatment should be reserved for the most skilled and experienced clinicians or teams.

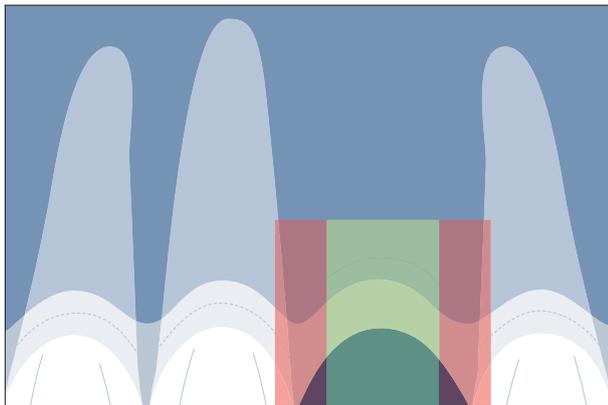


Fig 5 Correct implant position in the mesiodistal comfort zone (green).



Fig 8 Depth guide used to confirm appropriate depth of implant subsequent to placement.

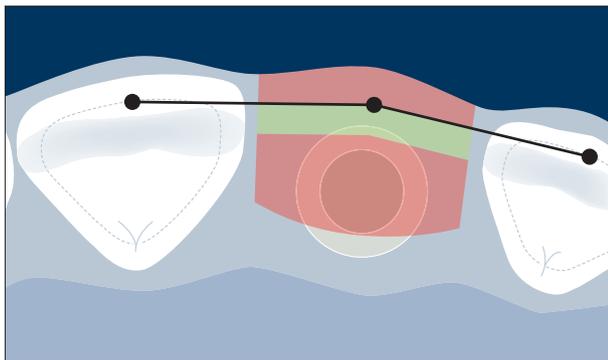


Fig 6 Orofacial comfort (green) and danger zones (red).



Fig 9 Surgical template communicating desired mesio-distal and oro-facial implant position.

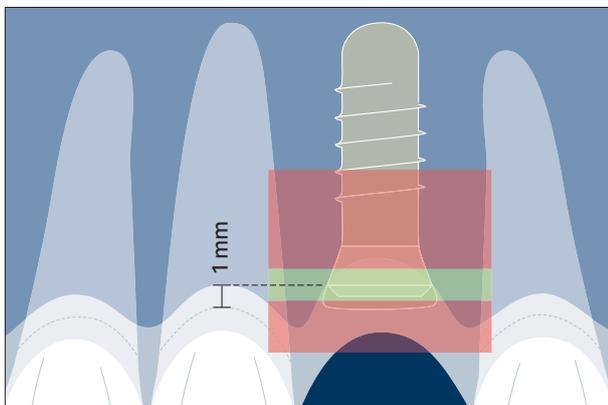


Fig 7 Comfort (green) and danger zones (red) in the coronal dimension.

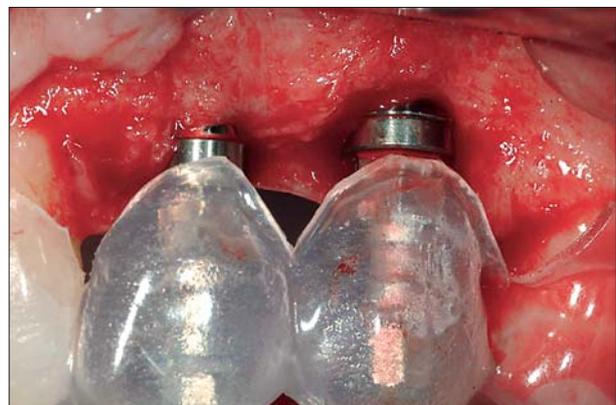


Fig 10 Depth template in position communicating proposed position of the final mucosal margin.