

# Dental Implant Prosthetics

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EDITION

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DENTAL IMPLANT PROSTHETICS, SECOND EDITION  
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ISBN: 978-0-323-07845-0

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#### Library of Congress Cataloging-in-Publication Data

Misch, Carl E., author.

Dental implant prosthetics / Carl E. Misch.—Second edition.  
p. ; cm.

Includes bibliographical references and index.

ISBN 978-0-323-07845-0

I. Title.

[DNLM: 1. Dental Implantation—methods. 2. Dental Implants. 3. Patient Care Planning.

WU 640]

RK667.I45

617.6'93—dc23

2014000620

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*Design Direction:* Maggie Reid

Printed in China

Last digit is the print number: 9 8 7 6 5 4 3 2 1



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*To my parents, MaryAnn Misch and Carl Otto Misch.  
And to my children, Paula Angeline Mather, Carl Patrick Misch,  
Lara Elizabeth Vandekerckhove, David John Misch, Jonathan Edward  
Misch, and Angela Marie Misch.  
I love you all very much.*

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Feast your mind on the writings of a master dental implant clinician and teacher.

This second edition of *Dental Implant Prosthetics* is more than an update of the widely read and referenced first edition. It is more than a juxtaposition of old and new relevant implant prosthetic thinking. It is a confluence, a continuum, and an expansion of encyclopedic knowledge by a pre-eminent implant prosthodontist, Dr. Carl E. Misch.

Dr. Misch's professional background, that includes decades of practice and teaching, encompasses both the infancy and emergence of dental implantology, its renaissance, and its current prominence in the panoply of total and advanced dental treatment. This book is a reflection of this expansive sum of accumulated knowledge.

It includes the solid footing of implant biomechanics, implant biomaterials, pretreatment prostheses, radiographic imaging, and the otherwise too often neglected subject of occlusion. It is a text. It is a learning tool. It brings us back to basics and then proceeds beyond the basics into the current realm of

In 2005, I had the honor to write a brief foreword to Dr. Carl E. Misch's book *Dental Implant Prosthetics*, which has since become a classic, translated into many languages and influencing many thousands of his colleagues. A true dental "best seller" of all time.

Dr. Misch, as a member of the healing arts and sciences, has greatly benefited from the previous valuable contributions of many. Let us not forget Semmelweis, who introduced the concept of surgical cleanliness involving hands, instruments, clothing, drapes, and bandages, thereby saving hundreds of thousands of lives by preventing puerperal fever and, by extension, positively altering basic wound healing therapy. In the end, he was condemned by none other than the brilliant surgeon Virchow. It was ironic that Semmelweis died after contracting septicemia at the young age of 47, and at his own hand. In rapid order we were bombarded by the works of Lister, Pasteur, and Koch. Dentistry contributed greatly to the growing field of anesthesia, which allowed a burgeoning number of surgical procedures. Three areas, however, remained untouchable: the heart, brain, and spinal cord.

In 1896, long before the introduction of antibiotics, Dr. Louis Rehn, of the Frankfurt City Hospital, treated a patient who had been stabbed with a knife between the ribs through the pericardium and into the heart itself. Rehn acted decisively and made an incision in the fourth intercostal space, severed the fifth rib, and probed the thoracic cavity. The patient's left lung then collapsed. However, Rehn was able to clasp the pericardium, remove copious clots and blood, and visualize the still beating heart. In between beats, the wound to the right ventricle was sutured. In short order, the hemorrhage stopped and the patient survived. The principles of aseptic surgery were

patient treatment. This book tells us where we have been and where we should be. It is not a glossy picture book that satisfies our eyes, but rather a book of words that are essential to the sound practice of implant dentistry.

These words teach not only the neophyte clinician but also renew the clinical platform that sustains the experienced practitioner. You are not an "experienced clinician" unless you renew and refresh why you are doing what you are doing. The end result of oral implantology is the well-planned fabrication and insertion of a viable prosthesis. The reconstructive principles described in this book fulfill the guidelines and parameters that constitute the processes of dental implant prosthetic reconstruction.

Dr. Misch has done the dental implant clinician a favor by compiling this updated edition. It is a reflection of his sense of duty to continue to educate. This book is "boot camp" for us all.

Morton L. Perel, DDS, MScD, FACD, FICD

followed. And while some complications ensued, the patient returned to complete health and was presented by Dr. Rehn at a surgical conference in Berlin.

What does this all have to do with Dr. Misch's new edition? Carl has often personally told me that his ultimate goal in dedicating his life to dental implantology was "to advance the field" as others mentioned above clearly have. If we recognize that our patients do not necessarily want implants *per se*, but rather they want the prosthodontic results (i.e., teeth that permit function, smiles, social interactions, self-confidence, etc.), which would be in many cases supported by implants, then, and only then, will we all realize the great contribution that will be made for decades to come by the second edition of *Dental Implant Prosthetics*.

Another consideration that we should all appreciate is who will be the beneficiaries of this expanded work? Over the past 40 years, thousands of our dental colleagues have been introduced to implantology by Dr. Misch's lectures. Almost five thousand seriously committed dentists, specialists as well as generalists, have graduated from the Misch Implant Institutes in the United States and abroad. Dental educators, as well as students, rely on Dr. Misch's prosthodontic continuum not only for understanding but also for basic language, treatment planning, multiple updates, and clinical techniques.

Dr. Misch's second edition is not a prolegomena. It is a Bible.

This short commentary is submitted with great personal and professional admiration and respect.

Kenneth W.M. Judy, DDS, FACD, FICD  
Co-Chairman, International Congress of Oral Implantologists

# Preface

In the early 1900s, fixed partial dentures to replace missing teeth in a partially edentulous patient were vehemently opposed, and removable partial dentures were strongly encouraged. In 1911, Hunter blamed the “mausoleum of gold over a mass of sepsis” for complicating systemic conditions of anemia, gastritis, kidney disease, and lesions of the spinal cord.<sup>1</sup> Despite this popular belief, fixed partial dentures became the standard of care to replace missing teeth and are still taught in every dental school in North America. In fact, if a dental student does not perform a traditional fixed partial denture, they do not graduate and join the dental community.

In the 1970s, the mere mention of dental implants was controversial. Organized dentistry feared that these devices would always fail and could lead to a brain abscess or heart failure, because it was believed there was no barrier between the oral bacteria and the systemic pathways. However, in spite of this obstacle, a few hundred dentists around the world observed that patients readily accepted dental implants to support a mandibular complete denture or believed that a fixed implant prosthesis was more desirable than using removable restorations or preparing and joining adjacent teeth for fixed prostheses.

Today we are in the midst of a dental implant revolution. There are more scientific and clinical articles written on dental implants than any other topic in dentistry. From 1950 to 1985, there were approximately 500 referred articles published on dental implants. Between the years 1985 and 1995, there were more than 1500 articles published on dental implants. More recently, from 1995 to 2005, there were over 5000 articles published in referred journals on topics related to dental implants. Today, the dental implant is now accepted as a primary method to replace a single tooth or multiple adjacent missing teeth, or to support a removable or fixed prosthesis for a completely edentulous patient.

In the United States, the total sales of implant products to the dental profession from 1950 to 1985 was less than \$1 million each year, and from 1985 to 1995 the sales increased to \$100 million per year. The sale of implant-related products from 1995 to 2005 skyrocketed to \$1 billion per year, and today is estimated at \$4 billion each year. However, this dramatic increase in sales has a downside. The rapid growth of dental implants as man-made abutments to replace missing teeth has caused technology to develop quickly and often without guidelines for evaluation. The driving force behind implant treatment should not be directed by dental advertising from manufacturers. Procedures should be based on scientific and clinical studies to determine what is predictable.

Implant dentistry has become a vital part of prosthodontics for partially and completely edentulous patients. All U.S. dental undergraduate programs and all U.S. specialty programs in prosthodontics must teach implant prosthetics to gain accreditation by their governing bodies. Several dental schools now

recommend that almost all mandibular dentures be retained by implants and that three-unit fixed prostheses may be replaced by single-tooth implants. More than 90% of all U.S. general dentists have restored implants or referred a patient for an implant prosthesis. However, most dentists who perform implant restorations have not completed a structured, supervised program specific for implant prostheses. Instead, the implant is restored in a similar scenario as natural teeth. However, although only a minority of practitioners take the time and effort to learn all aspects of this rapidly growing and evolving field, the majority of dentists can provide various aspects of implant treatment.

The good news is that dental implant restorations have the highest survival rate compared with any other type of prosthesis to replace missing teeth. They do not decay or require endodontic treatment. They are also less prone to fracture and resist periodontal-like disease better than a tooth. The bad news is that the treatment plan, the fabrication of the restoration, the occlusion, the maintenance, and the treatment of complications (such as screw loosening, crestal bone loss, prosthesis fracture, or implant failure) are most often unique to implant dentistry.

The second edition of *Dental Implant Prosthetics* addresses the science and discipline of implant dentistry. Compared to the first edition, this book has nearly doubled in size and has added new chapters in treatment planning and implant prosthetics. In addition, more than 2000 illustrations have been used to detail related concepts.

An underlying theme of *Dental Implant Prosthetics* is to base the treatment of missing teeth on the sciences related to implant dentistry. This book does not attempt to be an encyclopedia of all that is possible in the restoration of an implant patient. Instead, it is a text that relates one chapter to every other chapter and presents a common thread of science and past experience to the art of replacing teeth. Every chapter is carefully blended to be consistent in purpose: to provide a predictable outcome.

The first part of *Dental Implant Prosthetics* sets the stage for understanding the importance of implants to a dental restorative practice. The second part of the book covers the related basic sciences of biomechanics and biomaterials, exploring why biomechanics should be used as a basis of implant treatment planning as a way to reduce complications. Implant dentistry does not guarantee a result, nor is it without complications. However, there is a consistent theme to reduce and eliminate many complications, and this theme starts with a biomechanically based treatment plan.

Implant treatment planning, the focus of the third part of this book, has been expanded in this edition. More than 50 implant dental criteria may influence treatment planning and prognosis. A generic seven-step process for treatment planning is presented. Chapters in this part look at stress treatment theorem for implant dentistry, prosthetic options, force factors, bone density, implant body size, preimplant prosthodontics, and diagnostic casts, surgical templates, and provisionalization.

<sup>1</sup>Hunter W: The role of sepsis and antisepsis in medicine, *Dent Briefs* 16:852, 1911.

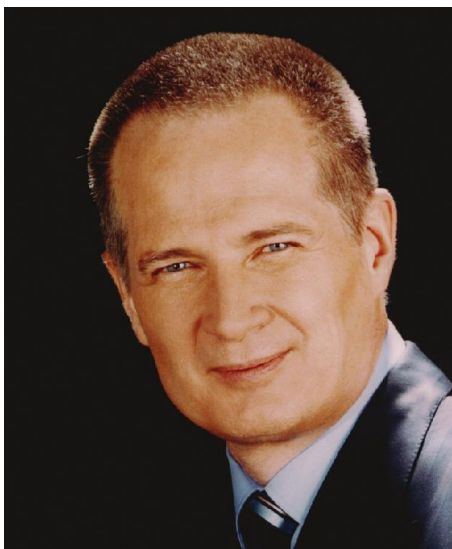
The fourth part of this book on special treatment options looks at single tooth replacement and restoration, maxillary posterior edentulism, the edentulous mandible, and maxillary arch implant considerations. The single tooth replacement is often the first introduction to implant dentistry for restoring dentists. The posterior missing single tooth is addressed separately from the anterior missing tooth. The posterior regions missing a single tooth can be the easiest restoration. On the other hand, the maxillary anterior region can be the most difficult treatment to render in implant dentistry. The two extremes are detailed in separate chapters. The completely edentulous patient is a prime candidate for implant prostheses and is the topic of the several chapters in this section. Specific issues related to edentulism are addressed and unique treatment planning concepts are presented in a logical fashion. The principles of implant overdentures with bar and attachment support, retention, and stability are presented. The mandible and maxilla are addressed as separate chapters, since their complications are unique to each other.

Principles for fixed implant restorations are discussed in Part V. These guidelines may be used in almost every implant prosthesis for a partially edentulous patient. In addition, progressive loading is presented for softer bone types and as a concept has matured since I introduced it in the late 1980s. Occlusion also is specifically addressed for both fixed and removable prostheses.

The final part of *Dental Implant Prosthetics* presents the long-term evaluation and maintenance of dental implants.

*Dental Implant Prosthetics* and my other book, *Contemporary Implant Dentistry*, published by Elsevier, have been used over the years as textbooks for dental students, interrelated dental residents, postgraduate programs, implant residents, specialists, and generalists. Their translation into more than 10 languages and their widespread acceptance have provided a thinking process for oral implantology. This most recent edition attempts to help further elevate the science and discipline of implant dentistry and allow predictable treatment to replace missing teeth for the patients we treat and the doctors we train.

## About the Author



Carl E. Misch is a Clinical Professor and Past Director of Implant Dentistry in the Department of Periodontology and Implant Dentistry at Temple University Kornberg School of Dentistry. He is also a past Clinical Professor in the Department of Periodontics/Geriatrics at the University of Michigan School of Dentistry. Dr. Misch is also a past Clinical Professor in the Department of Restorative Dentistry at the University of Detroit–Mercy School of Dentistry. He is also a past Board of Trustee member-at-large for the University of Detroit Mercy School. In addition, he is an Adjunct Professor at the University of Alabama at Birmingham, School of Engineering, Department of Biomechanics. He was Co-Director or Director of the Oral Implantology Residency Program at the University of Pittsburgh School of Dental Medicine from 1986 to 1996.

Dr. Misch graduated *Magna cum laude* in 1973 from the University of Detroit Dental School and received his Prosthodontic Certificate, Implantology Certificate, and Master's Degree in Dental Science from the University of Pittsburgh. He has been awarded two honoris causa PhD degrees, from the University of Yeditepe in Istanbul, Turkey, and Carol Davila University of Medicine and Pharmacy in Bucharest, Romania. Other graduate honors include 13 fellowships in dentistry, including Fellow of the American College of Dentistry, Fellow of the International College of Dentists, Fellow of the International College of Dentists, Fellow of the American Association of Hospital Dentistry, Fellow of the Academy of Dentistry International, and Fellow of the Pierre Fauchard Academy. Dr. Misch has more than 10 patents related to implant dentistry and is the co-inventor of the Biohorizons Dental Implant System.

Dr. Misch is a diplomate and past president of the American Board of Oral Implantology/Implant Dentistry and served as

member of the diplomate examining committee for 7 years. He is a past president of the International Congress of Oral Implantologists, which represents more than 100 countries and is the world's largest implant organization, the American Academy of Implant Dentistry, the Academy of Implants and Transplants, and the American College of Oral Implantologists.

In 1984, Dr. Misch founded the Misch Implant Institute. Currently, training centers for the institute are located in Florida, Michigan, Nevada, and Toronto, Canada. Over the years, the Misch Implant Institute has had training centers in Korea, Italy, Brazil, Japan, the United Kingdom, Monaco and Spain. In the United States and Canada, the Institute has had centers in Florida, Georgia, Maryland, Texas, New York, Illinois, Vancouver, and Montreal. As Director, Dr. Misch has trained more than 5000 doctors in a hands-on yearly forum of education in implant dentistry. Programs are offered in both the surgical and prosthetics aspects of patient care.

Dr. Misch has now edited three editions of *Contemporary Implant Dentistry* and two editions of *Dental Implant Prosthetics*. These five textbooks have been translated into Italian, Korean, Portuguese, Turkish, Spanish, Farsi, Japanese, Chinese (Simplified), Greek, and Russian, and they are used in dental schools around the world for graduate and postgraduate programs. Dr. Misch has published more than 250 articles related to implant dentistry. During the past 30 years, Dr. Misch has lectured more than 1000 times in all 50 states of the United States and in more than 47 countries throughout the world.

Dr. Misch has six children: Paula, Carl, Lara, David, Jonathan, and Angela.



# Acknowledgments

This is the fifth book I have written that shares my experience, training, and knowledge in a discipline to which I have dedicated my life. This process began with my three original mentors: Ken Judy, Leonard I. Linkow, and O. Hilt Tatum. They will always be acknowledged in my lectures, articles, and chapters. Implant dentistry needed early pioneers to blaze the trails for the profession. Their concepts of bone grafting, implant surgery, prosthetics, implant education, and leadership created a foundation 40 to 50 years ago that allowed the profession to build the current structure we have today in implant dentistry. Through the years, all three of these gentlemen have become great friends, and I continue to learn from them. I especially thank each of them for providing their personal continued guidance and support to me over the last 40 years.

There also are many people to acknowledge and thank in preparation of *Dental Implant Prosthetics*, second edition. Allow me to begin with all participating authors: Martha Warren Bidez, Lee Culp, Jack E. Lemons, Michael S. McCracken, Francine Misch-Dietsh, Girish Ramaswamy, Randolph R. Resnik, J. Todd Strong, Jon B. Suzuki, Lynn D. Terracciano-Mortilla, and Natalie Y. Wong. Each co-author was selected for his or her unique additional knowledge. Their dedication to implant dentistry and their friendship and personal support to me is greatly appreciated.

Thank you to Jill Bertelson. Since I hand write every chapter and hand write every chapter edit more than 20 times, she types

and retypes every sentence in this book. She also coordinated the chapters with the publisher.

Each book takes a toll on my immediate family. During this project, my youngest son and daughter, Jonathan and Angela, bore the brunt to the time and pressures to write this book. Thank you for understanding and giving up our personal time.

I also would like to thank Brian Loehr and Kathy Falk of Elsevier/Mosby. Thank you for your patience, experience, and guidance during this process.

Thank you to Heidi Cartegena and Jennifer Luczak, my executive and private assistants, for all the coordination required in organizing this text. I would also like to thank the Dental Laboratory Team: Nemer Hussain, Tom and Beatrice Dabrowsky, LDT, BIT Dental Studios, Dillon, CO. Kim Bradshaw-Sickinger, President and CEO Micro Dental Laboratories (DTI), and Rebecca Caprroso (Tata) my surgical and prosthetic assistant.

The second edition of *Dental Implant Prosthetics* is also a reflection of the five thousand doctors I have trained around the world at the Misch International Implant Institute since 1984. Those doctors contributed by the questions asked and their desire for an organized approach to help their patients. I wish to thank each of them for their professional support.

Carl E. Misch



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