Dental Implant Complications
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List of contributors

Dario Adolﬁ DDS, CDT  
Dental technician, Director of the Spazio Education in Dentistry, Itaim Bibi, São Paulo, Brazil

Maurício Contar Adolﬁ DDS  
Director of the Periodontal and Oral Implantology Department, Spazio Education, São Paulo, Brazil

Kivanç Akça DDS, PhD  
Professor of Prosthodontics, Hacettepe University, Faculty of Dentistry, Department of Prosthodontics, Ankara, Turkey

Oded Bahat BDS, MSD  
Postgraduate, Periodontology University of Washington, Seattle, WA, USA  
Private practice limited to periodontology and surgical implant reconstruction, Beverly Hills, CA, USA

William Becker DDS  
Co-Editor-in-Chief, Clinical Implant Dentistry and Related Research

Avinash S. Bidra BDS, MS  
Program Director and Maxillofacial Prosthodontist, Postgraduate Prosthodontics, University of Connecticut School of Dental Medicine, Farmington, CT, USA

Daniel Buser DDS, Dr med dent  
Professor and Chair, Department of Oral Surgery and Stomatology, University of Bern, School of Dental Medicine, Bern, Switzerland

Bobby Butler DDS  
Private practice, Mission Viejo, CA and Affiliate Faculty, University of Washington, Seattle, WA, USA

Brian C. Butler DDS, MS  
Private practice, Denver, CO, USA

Stephen T. Chen BDS, MDSc, PhD  
Clinical Associate Professor, Melbourne Dental School, The University of Melbourne, Carlton, Victoria, Australia

Sang-Choon Cho DDS  
Clinical Assistant Professor, Director of Advanced Program for International Dentists in Implant Dentistry, Ashman Department of Periodontology and Implant Dentistry, College of Dentistry New York University, New York, USA

Stephen J. Chu DMD  
Clinical Associate Professor Periodontology and Implant Dentistry, New York Dental Center, New York, USA

Donald S. Clem DDS, FACD  
Regenerative Solutions, Fullerton, CA, USA

Lyndon F. Cooper DDS, PhD  
Stallings Distinguished Professor Department of Prosthodontics, University of North Carolina School of Dentistry, Chapel Hill, NC, USA

Fereidoun Daftary DDS, MScD  
Prosthodontist and Former Chair of Department of Fixed Prosthodontics, University of Southern California, Los Angeles, CA, USA  
Private practice in Beverly Hills, CA, USA

Steven E. Eckert DDS, MS  
Professor Emeritus, Mayo Clinic, College of Medicine, Rochester, MN, USA

Cyril I. Evian DMD  
Clinical Professor, Periodontics and Implant Dentistry, University of Pennsylvania, PA, USA  
Diplomate of the American Board of Periodontology
Filippo Fontana DDS, MS  
Visiting Professor, UOC Chirurgia Maxillo Faciale e Odontostomatologia, Fondazione IRCCS Ca’ Granda, Ospedale Maggiore, Policlinico, University of Milan, Milan, Italy

Scott H. Froum DDS  
Clinical Assistant Professor, Department of Periodontology, State University of Stony Brook School of Dental Medicine, Stony Brook, NY, USA

Stuart J. Froum DDS  
Clinical Professor and Director of Clinical Research, Department of Periodontology and Implant Dentistry at New York University College of Dentistry, New York, USA

Jeffrey Ganeles DMD, FACD  
Private practice, Boca Raton, FL USA  
Assistant Clinical Professor, Nova Southeastern University, Fort Lauderdale, FL, USA

Scott D. Ganz DMD  
Adjunct Clinical Assistant Professor, Department of Restorative Dentistry, Rutgers School of Dental Medicine, Newark, NJ, USA  
Clinical Attending, Hackensack University Medical Center, Hackensack, NJ, USA  
Private practice, Fort Lee, NJ, USA

Charles J. Goodacre DDS, MSD  
Professor of Restorative Dentistry, Loma Linda University School of Dental Dentistry, Loma Linda, CA, USA

David Grossberg BDS, FICD  
Private practice, Sydney, NSW, Australia

Emily E. Hahn DMD  
Georgia Regents University, Advanced Education Periodontics, Augusta, GA, USA

Ole T. Jensen DDS, MS  
Adjunct Professor, University of Utah, School of Dentistry, Salt Lake City, UT, USA

Mathew T. Kattadiyil BDS, MDS, MS  
Professor and Director, Advanced Specialty Education Program in Prosthodontics, Loma Linda University, School of Dentistry, Loma Linda, CA, USA

Niklaus P. Lang DMD, MS, PhD, Odont. Dr.h.c. mult., Hon FRCPs (Glasgow)  
Professor Emeritus, University of Berne, Switzerland  
Honorary Professor, University of Zurich, Switzerland

The University of Hong Kong  
University College, London, UK

Burton Langer DMD, MSCD  
Private practice, New York, USA

Laureen Langer DDS  
Private practice, New York, USA

Maristela Lobo DDS, MS, PhD  
Clinical Professor of the Advanced Program in Implant and Esthetic Dentistry, SENAC, São Paulo, Brazil

Ramin Mahallati DDS  
Center for Implant & Esthetic Dentistry, Beverly Hills, CA, USA

Pamela K. McClain DDS  
Private practice of periodontics  
Associate Clinical Professor, University of Colorado School of Dental Medicine, Aurora, CO, USA

Brian L. Mealey DDS, MS  
Professor and Graduate Program Director, Department of Periodontics, University of Texas Health Science Center at San Antonio School of Dentistry, USA

Craig M. Misch DDS, MDS  
Private practice, oral & maxillofacial surgery, Sarasota, FL, USA  
Clinical Associate Professor, University of Florida, Department of Prosthodontics/Periodontics, Gainesville, FL, USA

Panos Papaspyridakos DDS, MS, PhD  
Tufts University School of Dental Medicine, Department of Prosthodontics and Operative Dentistry, Boston, MA, USA

Kirk Pasquinelli DDS  
San Francisco Periodontics and Dental Implants, San Francisco, CA, USA

Isabella Rocchietta DDS  
Department of Biomaterials, Institute for Clinical Sciences, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden  
Private practice, London, UK

Louis F. Rose DDS, MD  
Clinical Professor of Periodontics, University of Pennsylvania, School of Dental Medicine, Philadelphia, PA, USA
Paul S. Rosen DMD, MS, FACD
Diplomate of the American Board of Periodontology
Clinical Professor of Periodontics, Baltimore College
of Dental Surgery, University of Maryland, Baltimore,
MD, USA
Clinical Professor of Periodontology and Oral
Implantology, Temple University Kornberg School of
Dentistry, Philadelphia, PA, USA
Private practice, Yardley, PA, USA

Edwin S. Rosenberg BDSH Dip Dent, DMD,
FICD, FACD
Diplomate of the American Board of Periodontology
Clinical Professor of Implant Dentistry and Periodontics,
Clinical Professor of Surgical Sciences, Department
of Periodontology and Implant Dentistry, New York
University College of Dentistry, New York, USA
Professor of Implant Dentistry, Perio and Pros, Hebrew
University, School of Dentistry, Jerusalem, Israel
Adjunct Professor of Medicine and Surgery, Department
of Medicine and Surgery, Drexel University,
Philadelphia, PA, USA
Clinical Professor and Consultant of Periodontics and
Implant Surgery, Eastman Dental College, University
College London, UK

Chris Salierno DDS
Private practice, Melville, New York, NY, USA

Thomas J. Salinas DDS, FACP
Professor of Dentistry, Department of Dental Specialties,
Mayo Clinic, Rochester, MN, USA

Oswaldo Scopin de Andrade DDS, MS, PhD
Director of the Advanced Program in Esthetic and
Implant Dentistry, SENAC University, São Paulo, Brazil

Massimo Simion MD, DDS
Professor and Chairman, Department of
Periodontology, University of Milan, Maxillo-Facial
and Odontostomatologics Unit, Fondazione Cà Granda
IRCCS, Ospedale Maggiore, Policlinico, University of
Milan, Milan, Italy

Harel Simon DMD
Clinical Associate Professor, Ostrow School of Dentistry
of USC, Los Angeles, CA, USA
Private practice limited to prosthodontics, Beverly Hills,
CA, USA

J. Kobi Stern DMD, MSc
Diplomate of the American Board of Periodontology
Diplomate of the International Congress of Oral
Implantologists
Director, Advanced Education in Periodontics, College
of Dental Medicine, Georgia Regents University,
Augusta, GA, USA

Richard M. Sullivan DDS
Vice President, Clinical Technologies, Nobel Biocare
North America

Dennis P. Tarnow DDS
Director of Implant Dentistry, Columbia University
College of Dental Medicine, New York, USA

Tiziano Testori MD, DDS
Head of Implant Dentistry and Oral Rehabilitation,
Department of Biomedical, Surgical and Dental
Sciences, IRCCS, Galeazzi Institute, University of Milan,
Milan, Italy
Private practice, Como, Italy

Michael Toffler DDS
Private practice, New York, USA

Maurizio S. Tonetti DMD, MSSc, PhD
Executive Director, European Research Group on
Periodontology (ERGOFerio), Genova, Italy

Farhad Vahidi DMD, MSD, FACP
Associate Professor, Department of Prosthodontics,
New York, USA

Jonathan Waasdorp DMD, MS
Department of Periodontics, University of Pennsylvania
School of Dental Medicine, Pennsylvania, PA, USA
Private practice, Bala Cynwyd, PA, USA

Chandur P.K. Wadhwani BDS MSD
Adjunct Assistant Professor, Department of Restorative
Dentistry, Loma Linda University, Loma Linda, CA,
USA
Affiliate Faculty, Department of Restorative Dentistry,
University of Washington, Seattle, USA
Private practice limited to prosthodontics, Bellevue,
WA, USA

Barry D. Wagenberg DMD
Director of Dental Education, Newark Beth Israel
Department of Dentistry, NJ, USA
Associate Clinical Professor, New York University
School of Dentistry, New York, USA
Dennis E. Waguespack DDS, MS  
Private practice, Denver, CO, USA

Stephen S. Wallace DDS  
Associate Clinical Professor, Columbia University  
College of Dental Medicine, Division of Periodontics,  
New York, USA  
Diplomate of the International Congress of Oral  
Implantology  
Fellow of the Academy of Osseointegration

Hans-Peter Weber DMD, Dr med dent  
Tufts University School of Dental Medicine, Department  
of Prosthodontics and Operative Dentistry, Boston, MA,  
USA

Mea A. Weinberg DMD, MSD, RPh  
Clinical Professor, Department of Periodontology and  
Implant Dentistry, New York University College of  
Dentistry, New York, USA

Thomas G. Wilson, Jr. DDS  
Private practice of periodontics, Dallas, TX, USA

Edwin J. Zinman DDS, JD  
Former Lecturer, UCSF Department of Periodontology,  
San Francisco, CA, USA  
Law Offices of Edwin J Zinman, DDS, San Francisco,  
CA, USA
Foreword

The timely publication of Dental Implant Complications, second edition, presents significant, interesting new information to the clinician. Osseointegrated implants introduced predictability for patient care as an alternative to traditional dental therapies. The early evidence, by Brånemark and his team, provided implant-supported prostheses for edentulous patients and the contemporary scope of treatment has expanded to the partially dentate patient, opening the door to innovation.

The dental community at large explored the possibilities for expansion, including implants placed in extraction wounds, localized enhancement of the atrophic alveolar ridge, construction of bone in the maxillary sinus, and immediate loading of the prosthesis. Of special interest has been the concept of satisfying the patient’s esthetic demands by extending the prostheses subgingivally, thus introducing the term “peri-implantitis.”

On examination of the curricula of recent symposia, precious time is devoted to the management of these complications. There is a collision of ideologic thoughts as to whether the etiology is mechanical force of the prostheses or inflammation relative to bacterial infection, but nevertheless, it poses a major inconvenience.

This expansive textbook is a concerted effort to explore local and systemic factors that may be responsible for complications encountered in implant therapy. It oversees the myriad of therapies that have been described and provides insight into their value. It immediately becomes evident that there is not one etiology and there is not one common solution. The editor, Stuart J. Froum, has engaged surgical and prosthetic experts to direct the reader to a solution to their patients’ clinical problems.

The appropriate therapeutic diagnosis generally sets the tone for longevity. The advent of digital dentistry provides an opportunity to avoid many mechanical issues, but routine success depends upon the basic tenet of the implant residing within the boundaries of bone. Three-dimensional radiographs provide information before initiating therapy and navigational systems allow for successful accomplishment of this goal. One of the most serious complications one may encounter is an anatomic obstruction such as violating the inferior alveolar nerve or the maxillary sinus. Other diagnostic complications involve systemic disorders, medications, and an accurate medical history of the patient. All of these topics are presented in depth here. This edition emphasizes that it is far better to prevent complications than to treat them.

Surgical complications begin with the decision of whether to save the tooth or place an implant. If implants were 100% successful, there would be no need for this text; however, a careful reader can prepare themselves to diagnose and to surgically place an implant where indicated, in the proper position to avoid complications.

One must separate the patient population into a cohort of individuals with a tooth or teeth missing without the inconvenience of periodontal disease. Replacing congenitally missing teeth or a tooth lost to caries or trauma allows greater leeway with the engagement of the gingiva. A second cohort of periodontally compromised patients have already demonstrated their susceptibility to inflammation in the oral cavity and the implant-restored area must be cleansable by the patient and the hygienist. This can become an etiologic factor in the esthetic area which is very difficult to resolve.

Another esthetic issue engaged in this text is how to manage two adjacent implants. Once again, the text offers the reader the opportunity to plan appropriate treatment and prevent complications. There is a sincere effort to discuss advanced osteogenic surgical procedures and to consider appropriate biologics.

The advantages to patients of placing immediate implants in extraction wounds, of immediate loading with provisional prostheses and occasionally with a final prosthesis are obvious. Fewer procedures, considerably fewer office visits, and reduced financial commitment accompany this activity. This text underlines the
possibility of complications with advanced procedures and guides the reader through planning and execution to the treatment of the various complications if and when they occur.

There is a complete discussion of prosthetic complications and, once again, their prevention by diagnosis, thoughtful treatment planning, and maintenance of the result.

The consequences of inflammation are married to the need for a serious maintenance program for the oral cavity in concert with both the patient and the healthcare provider. All of these issues are discussed clearly in the text. Every dental office participating in implant dentistry should have this text in their library and become familiar with its wisdom before, during, and after treatment. It is a fabulously complete work and I congratulate the editor, Stuart Froum, and contributors.

Myron Nevins DDS
Associate Clinical Professor, Department of Oral Medicine, Infection & Immunity, Division of Periodontology, Harvard School of Dental Medicine
This is the second edition of *Dental Implant Complications: Etiology, Prevention, and Treatment*. As I wrote 5 years ago in the Introduction to the first edition, this book is written for any dentist placing and/or restoring implants. Its aim is to identify common and uncommon implant complications, discuss their etiology, and propose methods of prevention. Our hope is that by doing this the clinician will be able to assess the risks of and avoid, or reduce, many of the complications being seen today. Moreover, the treatments of these complications are discussed in detail, so if the reader experiences a similar or related problem they will be familiar with possible treatment options. Often a minor (and more often a major) complication can result in anguish for the patient, associated with pain, loss of income, and loss of time, and for the clinician loss of a patient and/or referral and possible legal problems.

The introduction of the concept of osseointegrated endosseous implants to the field of dentistry in the 1980s resulted in a paradigm shift that affected almost every aspect of dental care. Diagnosis and treatment planning now included an implant option for patients and clinicians alike. The inclusion of implant therapy became part of the undergraduate and graduate dental school curriculum. A significant part of every dental meeting included new research, new equipment, new techniques, and new products related to implant therapy. Technology for implant therapy, such as diagnostic software, computer tomography (CT), cone beam CT (CBCT) scans, three-dimensional printing, and computer-aided systems to place and restore implants, made the implant option easier and more predictable. Associated products, including bone grafts, bone substitutes, membrane barriers, machines to measure implant stability, Piezosurgery®, laser systems, and computer-generated guides, provided dentists with methods to expedite the placement of implants. New protocols for implant placement and restoration shortened the time required for replacement of an extracted or missing tooth with an implant-supported restoration.

However, as more dentists and patients chose the implant option, more complications and adverse events began to be recorded. Some of these complications were minor while others resulted in damage to the patient and failure of treatment. The aim of this book is to help both the novice and experienced implant clinician to avoid these problems and, if they occur, to teach the clinician how to treat or when to refer these complications for treatment.

Since the publication of the first edition, the number of dentists placing and restoring implants has increased significantly. According to the statistics from an independent research company (Millennium Research Group 2012), the number of implants sold in the United States alone in 2014 has increased by 680,000 when compared with 2010 (the year of the first edition of this book was published). According to another independent research group (i Data Research INC, 2013) the sales of implants, again in the United States alone, will increase over 5% per year from 2015 to 2017. Although the number of complications has not been calculated, more implants, more dentists placing them, and use in more complicated cases will inevitably lead to an increasing number and complexity of implant complications. Up to date knowledge is needed to determine their etiology, prevention, and treatment.

For the sake of organization, this book, like the previous edition, has been divided into implant complications associated with the diagnosis, treatment planning, placement, restoration, and maintenance of implants. While this division is arbitrary, and many complications have multifactorial etiology, the intention of this book is to help identify the most common implant complications. Each chapter presents information that will familiarize the clinician with these complications and hopefully decrease the number and extent of future complications. Moreover, the management of these complications will be described in depth in an attempt to provide guidance and direction to the clinician when he or she experiences any of these problems.
Each chapter will also provide a detailed analysis of the etiology, prevention, and treatment of specific complications. This second edition includes five new chapters reflecting the increase in the number and complexity of implant complications. In addition, the 25 original chapters have all been revised and updated to present the latest information on complications that have been diagnosed and treated by some of the most experienced dentists in practice and academics. Chapters and cases have been added, with 16 additional experts sharing their knowledge and expertise.

The reader will find that some chapters repeat information previously discussed relating to different complications (e.g., three-dimensional implant placement, use of CT or CB scans for implant planning, prosthetic solutions to implant malposition, esthetic complications, and requirements for a successful implant restoration). However, this repetition, rather than being viewed as redundant, should be considered basic to the prevention or management of several different types of complications. Moreover, the different authors present this information from various aspects of their clinical experience. This results in a more comprehensive understanding of a problem and actually increases knowledge of treatment options.

Also included are chapters discussing complications that may occur from various site development procedures designed to augment hard or soft tissue before or in conjunction with implant placement. Each chapter concludes with “Take-home hints,” serving as helpful reminders in avoiding or treating the complications discussed in the chapter. In addition, there is a chapter on “Medicolegal issues related to implant complications,” discussing implant procedures relative to the law. Following the format of the book, this chapter discusses methods of avoiding legal ramifications of implant complications and discusses what to do if a clinician is involved in legal action.

Lastly, two chapters on “Management of implant complications by the experts” have been included, containing case reports by a number of experienced clinicians who review a specific complication, describe how they treated it, and discuss how they may have prevented it from occurring given similar circumstances. Each chapter should serve as a practical clinical guide.

To quote Barry Le Patner: “Good judgment comes from experience, and experience comes from bad judgment.” It is hoped that the reader will gain good judgment from the experience of the contributing authors of this book.

Stuart J. Froum DDS
Chapter 1

Implant complications: scope of the problem

Stuart J. Froum DDS

Introduction

The introduction of endosseous dental implants as an option for restoring partially and fully edentulous patients has revolutionized dental treatment. High survival rates reported for single and multiple missing tooth replacements have validated the use of implant-supported restorations as a predictable method for oral rehabilitation [1–9]. In fact, owing to the improved function provided by implants, the Toronto Consensus Conference concluded that a two-implant-supported overdenture should be considered the standard of care (replacing the full denture) for mandibular edentulous patients [10].

Implants enable a single missing tooth to be replaced without restoring adjacent teeth. In addition, implants allow fixed restorations to be fabricated in patients who are fully or partially edentulous. Thus, the National Institutes of Health, Consensus Development Conference Statement in 1978 on Dental Implant: Benefits and Risk concluded that, “clinically, thousands of patients have been treated with dental implants for years and there is no question that many received long-term benefits.” However, the report further stated that, “some implants fail in patients within six months; and some have resulted in extensive bone loss and produced irreversible defects and complications” [11]. Although this report is more than 35 years old, and refers to different types of implant systems than those that are currently being used, problems with implant complications have grown in number and complexity. This is reflected in the increased number of articles, journals, and continuing education conferences that have recently been devoted to the topic of implant complications [12–31].

Two literature reviews reported that when implant success was defined as an implant-retained restoration free of complications, only 61% of patients after 5 years with implant-supported fixed partial dentures (FPDs) [28] and 50% of patients after 10 years with combined tooth/implant FPDs [20, 29] reported no complications.

Moreover, the prevalence of complications increased dramatically in some categories. In the 10-year study, for example, in terms of technical complications, the incidence of connection-related complications (screw loosening or fracture) rose from 4.3% after 5 years to 26.4% after 10 years. Of the 9% of restorations that were cemented, loss of retention of the restorations occurred in 6.2% within 5 years and 24.9% within 10 years [20]. Obviously, implant complications increase with the length of time an implant-supported restoration is in place.

The second edition of dental implant complications continues with the same format as first edition, where the various complications are discussed with respect to their etiology, prevention, and treatment. Since the publication of the first edition, five chapters have been added, covering newly recognized complications. Moreover, every chapter has been updated to encompass new knowledge and techniques that have been recognized and evolved since the publication of the first edition. Following a similar “Etiology, Prevention, and Treatment” format, this chapter addresses the scope of the problem regarding implant complications.

Etiology

There are several reasons for the increased numbers of implant complications being experienced by clinicians
Dental implant complications

in recent years. First, the total number of implants being placed has increased significantly over the past 10–15 years. The 2000 Survey of Current Issues in Dentistry, published by the American Dental Association, noted that over a 4-year span (1995–1999) the average number of implants placed by all dentists increased annually from 37.7 to 56.2 [32]. A dental implant overview evaluating the implant market by the Millennium Research Group in 2006 reported that from 2002 to 2006 the number of professionally active general practitioners rose from 125,230 to 130,830. During the same period the percentage of general practitioners rose from 5.0% to 19.0% [33]. As the number of general practitioners was increasing, the actual number of general practitioners placing implants in 2006 was four times higher than the number placing implants in 2002. In the years 2003, 2004, 2005, and 2006 the growth in the number of implants placed by general practitioners was 82%, 46.0%, 24.4%, and 20.1%, respectively. The Millennium Research Group reported that, “Global sales of dental implant systems ... are expected to maintain double digit growth over the next five years soaring to more than 4.5 billion dollars” [33]. In fact an independent survey reported that the number of dental implants sold in the United States alone will be over 2.7 million by 2017 [34]. Therefore, the increased numbers of implants and implant-related procedures being performed would have in itself resulted in a greater number of complications even if the percentage of adverse event occurrences remained the same [35].

The second reason is related to the fact that the increased number of implants being placed also reflects an increased number of dentists, varying in their clinical experience, placing and restoring implants. When first introduced to the profession, endosseous dental implants were primarily placed by oral surgeons and periodontists who had prior experience and training in bone and soft tissue surgery. However, as the number of dentists placing implants increased, more dentists, who did not routinely perform oral or periodontal surgery, began performing additional procedures as part of implant therapy. A recently published survey concluded that by 2015 more general dentists will be placing implants than all specialties combined [36]. Regrettably, in some cases this has resulted in an increased rate of implant-related complications. A recent article in the July 2014 issue of the Journal of the American Dental Association reporting on outcomes of implants and restorations placed in general dental practices reported the results of implant failures of 992 implants and patients from 87 practices. The results indicated a 7.0% failure rate when excessive bone loss was excluded from the analysis; “when excessive bone loss was included 18.7% (172/922) implants were classified as failures” [37]. This certainly is significantly higher than reported in the studies in which implants were placed and restored by specialists.

A third reason for the increased incidence of complications is related to the fact that until recently, there were few formal training courses in implant placement or restoration for dental students during their 4-year dental education [32]. Furthermore, the majority of that training was didactic in nature and did not include clinical experience with implant placement and restoration. From another perspective, many clinicians currently receive their implant training from continuing education courses offered by implant companies or private practitioners. These courses are less comprehensive than formal training programs and do not enable the participating dentist to become familiar with the breadth of complications that can occur.

The fourth reason for the increase in complications seen today is that dentists are placing implants in compromised sites using more aggressive protocols. Protocols today include implants placed at the same visit as tooth extraction, immediate provisionalization of the implant following placement, and in many cases the occlusal loading of an implant on the day of placement. Moreover, implants are being placed in compromised patients and/or in compromised sites where there is inadequate bone and soft tissue to fully emerge the implant [38]. Many of these sites require augmentation procedures before implant placement. Implants being placed in these augmented sites or with these aggressive protocols require more experience and skill than are required for routine implant placement. These added procedures, combined with the more aggressive implant protocols, provide more opportunities for complications to occur. An often quoted statement related to complex cases is: “The more complicated the case the more potential for complications.” When these complications arise, many dentists placing and/or restoring implants have little or no experience on how to handle the problem. The value of experience was recently demonstrated by a pilot for US Airways. On January 15, 2009, US Airways flight 1549 took off from La Guardia Airport in New York City. After several minutes in flight a flock of birds collided with the engines and both engines shut down. The pilot, Chesley Sullenberger, could not return to La Guardia airport or fly to a nearby airport to land the plane, which had completely lost power. Instead, he safely landed the plane on the Hudson River, thus saving all 155 people aboard. When asked how he managed to do this, Mr. Sullenberger replied: “For 42 years, I had made small, regular deposits of education, training,
and experience and the experience balance was sufficient that on January 15th, I could make a sudden, large withdrawal” [39]. Regrettably, many dentists placing implants today lack the education, training, and experience to make that “withdrawal”; in other words, to know what to do if and when an implant complication occurs.

The fifth reason for the increased incidence of implant complications indirectly arises from the lectures and courses that dentists attend. These courses frequently cite the high implant success rates reported in the literature. Although it is true that the survival rates of endosseous implants have been documented to be high (in the 90th percentile), a number of factors must be understood about the studies on which these data are based. First, in almost all cases the authors and investigators involved in the study were experienced surgeons or restorative dentists who were very familiar with implant placement, implant restoration, and the implant system that was used. In addition, the patient inclusion and exclusion criteria for these studies were usually very strict, resulting in exclusion of patients and sites that presented with high risk. Moreover, implant technology is changing so rapidly that the specific design and surfaced implants that were used and reported on in those studies are in most cases not available from the same company today. Newer implant surfaces on currently available implants may show improved results (more rapid integration or greater implant to bone contact) but only now is the long-term data of these implants beginning to become available. Therefore, long-term data for many implants currently being used are limited as to the number and the length of time for which these “new” implants have been studied, with only 4 or 13 implant systems having survival documentation of 10 years or greater (Table 1.1) [40–52]. In an article reviewing different implant surfaces, the authors stated, “many clinically well documented oral implant systems have largely been abandoned for the potential benefit of new, untested devices” [53]. Another misconception arises when lecturers speak of implant “success,” as opposed to implant survival. Traditionally, according to the literature, implant success was defined as an implant with no pain, no mobility, no radiolucent peri-implant areas, and minimum bone loss of less than 0.2 mm annually following the first year of loading [54]. Roos-Janasaker added to this definition by further defining a successful implant as one that loses no more than 1.0 mm of bone during the first year post placement [55]. Today the parameters for implant success also include the esthetic appearance of the final implant restoration. Many lecturers, sponsored by specific implant companies, will show their most successful esthetic cases that were accomplished using the sponsor’s implant system. Few failures or complications are seen in these presentations. Few in the audience may realize that, as is done in well-controlled research studies, the selection of patients (and implant sites) was carefully screened when a successful case is being shown (see Chapters 11, 14, 15, 24, and 25). Rarely does the audience see a flawed response, and even less often, a complication. Thus, in clinical practice, when “things go wrong” and complications occur or when a clinician’s results are not similar to what was shown in the lecture or symposium, the dentist, who was impressed by the “simplicity” and “reliability” of the implant system he or she purchased, is now at a loss as to what to do to rectify the unanticipated problem. Often times when a clinician, not experienced or knowledgeable about complications, attempts a “treatment” the problem is made worse and a solution more complex (Fig. 1.1).

**Table 1.1 Implant survival data with different implant systems**

<table>
<thead>
<tr>
<th>Company</th>
<th>Surface</th>
<th>Published study</th>
<th>Patients (n)</th>
<th>Implants (n)</th>
<th>Follow-up</th>
<th>Implant survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nobel</td>
<td>TiUnite</td>
<td>Mozzati [40]</td>
<td>90</td>
<td>209</td>
<td>11 years</td>
<td>97.10%</td>
</tr>
<tr>
<td>Biomet 3i</td>
<td>Osseotite</td>
<td>Browaeys [41]</td>
<td>83</td>
<td>749</td>
<td>7 years</td>
<td>91%</td>
</tr>
<tr>
<td>NanoTite</td>
<td>Östman [42]</td>
<td>42</td>
<td>139</td>
<td>1 year</td>
<td>99.40%</td>
<td></td>
</tr>
<tr>
<td>Straumann</td>
<td>SLA</td>
<td>Van Velzen [43]</td>
<td>250</td>
<td>506</td>
<td>10 years</td>
<td>99.70%</td>
</tr>
<tr>
<td></td>
<td>SLActive</td>
<td>Markovic [44]</td>
<td>13</td>
<td>37</td>
<td>1 year</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Tiz</td>
<td>Quiynen [45]</td>
<td>91</td>
<td>75</td>
<td>3 years</td>
<td>97.30%</td>
</tr>
<tr>
<td>Neoss</td>
<td>Multiple blasting</td>
<td>Zumstein [46]</td>
<td>50</td>
<td>183</td>
<td>12 months</td>
<td>98.20%</td>
</tr>
<tr>
<td>Biohorizons</td>
<td>LaserLok</td>
<td>Serra [47]</td>
<td>300</td>
<td>160</td>
<td>24 months</td>
<td>97.50%</td>
</tr>
<tr>
<td>Zimmer</td>
<td>RBM</td>
<td>Ormanian [48]</td>
<td>46</td>
<td>173</td>
<td>10 years</td>
<td>99%</td>
</tr>
<tr>
<td>Anklos</td>
<td>RBM</td>
<td>Romanos [49]</td>
<td>247</td>
<td>634</td>
<td>3 years</td>
<td>98.70%</td>
</tr>
<tr>
<td>Southern</td>
<td>RBM</td>
<td>Vandeweghe [50]</td>
<td>42</td>
<td>57</td>
<td>1–32 months</td>
<td>96.50%</td>
</tr>
<tr>
<td>Astra</td>
<td>TiOblast</td>
<td>Ravald [51]</td>
<td>66</td>
<td>184</td>
<td>12–15 years</td>
<td>95.50%</td>
</tr>
<tr>
<td>Bicon</td>
<td>HA coated</td>
<td>Urdaneta [52]</td>
<td>291</td>
<td>410</td>
<td>20 months</td>
<td>97.50%</td>
</tr>
</tbody>
</table>
Dental implant complications

Fig. 1.1 After a narrow-diameter implant was placed and fractured, the dentist attempted to treat the complication by placing another, standard-sized implant, thus complicating the complication. Photographs provided by S.H. Froum and P. Mann. Reproduced with permission from S.H. Froum and P. Mann.

Anyone placing or restoring implants must be prepared for the possibility of potential complications. These may be minor or major, reversible or irreversible in nature. Some of the problems that we are seeing with implant complications today include implant fracture (Fig. 1.2), implant failure (Fig. 1.3 a,b) malposed or nonrestorable implants (Fig. 1.4) (see Chapters 29 and 30), peri-implantitis (Fig. 1.5 a, b), esthetic implant failures (Fig. 1.6), and implants causing permanent damage to vital structures or teeth (i.e., sensory damage, damage to adjacent teeth, sinus complications, and loss of bone and soft tissue when implants fail or require removal) (Figs. 1.7, 1.8, and 1.9). These adverse events are a growing concern to the dental community.

The following observations and advice regarding implant complications, their etiology and sequelae as they relate to medicolegal issues are offered by Mr Art Curley, who is a senior trial attorney in the San Francisco-based healthcare defense firm of Bradley, Curley, Asiano, Barrabee & Gale PC:

Dental implant related technology has evolved geometrically over the last 30 years to the point that the occurrence of complications and failures, once considered risks in the 1970s, may now be used as evidence of negligent care (legally: failure to meet the standard of care) for which the practitioner may be held liable.

Recently a boarded specialist placed an implant in contact with the inferior alveolar nerve (IAN) resulting in significant chronic and untreatable pain. Plaintiff’s attorney sent the client for 3D scan which confirmed the implant as being in the IAN canal. That image begged the question, if, post-op, an imaging system can show exactly where the implant is, why wasn’t one either taken and used or at least offered to the patient prior to surgery to prevent nerve damage? The result was a verdict of $1,700,000. Two similar cases, involving iatrogenic nerve damage causing chronic pain and associated wage loss, resulted in settlements of $900,000 and $850,000.
Mr. Curley offers the following advice and recommendations:

The law considers the occurrence of complications as evidence in a claim of malpractice. Generally, there is a 3 point test as to whether a complication is evidence of a risk of treatment or evidence of a malpractice. A risk is a complication that cannot be avoided with the application of reasonable and prudent skill, care and technology. Skill is the physical conduct, such as the location placement of an implant. Care is the education, instruction and management of the patient before, during and after the treatment in question, such as clear post-operative instructions. Technology is the employment of tools, including testing equipment, imaging, and digital analysis and computation, such as the use of CBCT before and after surgery. Documentation as to the physical techniques employed, the instruction and consent process, and the offering of best imaging are critical in deterring and defending claims of malpractice.

Thus, a potential and undesirable result of these increased complications is that malpractice claims and therefore malpractice insurance premiums may eventually become so expensive for dentists utilizing implant restorations, so as to limit the use of implants as a restorative option (not unlike what occurred with obstetricians, many of whom stopped delivering babies). Lastly, with increased problems resulting from implant complications, third-party regulation may become more restrictive as to when and where implants may be used.

Fig. 1.5 (a) Clinical photograph of implant affected by peri-implantitis (note circumferential bone loss). (b) Periapical radiograph of implant in (a).

Fig. 1.6 Poor implant esthetics on the right implant-supported central incisor crown.
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**Fig. 1.7** Mandibular right distal implant impinging on the inferior alveolar nerve.

**Fig. 1.8** Poorly positioned implant hitting the adjacent natural tooth.

**Fig. 1.9** (a) A failed implant prior to removal with 90% of bone loss caused by peri-implantitis. (b) The defect present following explantation of the implant.

**Prevention and treatment**

Most problems may be avoided if the implant companies promote, and clinicians adhere to, good clinical practice. This includes better and more comprehensive training for clinicians. Moreover, as the code of ethics prescribes (Section 2. Principle: Non-malfeasance, “do no harm”), “the dentist’s primary obligations include keeping knowledge and skills current (and) knowing one’s own limitations” [56]. In addition, both dentists and implant companies should adhere to responsible advertising to avoid unrealistic expectations by clinicians and
implantation” [58]. Knowledge regarding the etiology, prevention, and treatment becomes extremely important (see Chapter 9). The importance of a complication (e.g., sinus perforation) to the survival of the implant is an issue that is far from equivocal. Although several authors found no correlation between sinus membrane perforation (SMP) and implant survival [59, 60], others show a direct link between SMP and complications, including a lower implant survival rate [61, 62]. In all cases treatment of the perforation becomes paramount (see Chapter 19). Therefore, any clinician performing a sinus augmentation should be familiar with the etiology and treatment of this complication.

The “treatment” of the problem of an increasing incidence of complication occurrence is ironically in the “prevention” of these problems from occurring. Better case selection, knowledge of systemic problems that can result in complications, and better treatment planning are all essential to reduce the risk of complications (see Chapters 2 and 4). Use of available technology and diagnostic tools, such as computer tomographic scans, cone beam scans, surgical guides, computer treatment planning, and aids to assess primary implant stability (i.e., Periotest, Osstell), along with piezoelectric surgical machines, can aid the clinician in obtaining more predictable planning, placement, and restoration of implant-supported restoration (see Chapter 5).

Familiarity with medications commonly used in implant therapy is essential to any dentist in avoiding complications at the time of implant placement, augmentation procedures, as well as post surgically (see Chapter 3).

Finally, knowledge, learning, and experience are paramount to reducing the number of and severity of complications that will inevitably occur. Unfortunately, the statement “the trouble with using experience as a guide is that the final exam often comes first and then the lesson” [63] is often quoted and all too true. However, by reading about the various complications in the ensuing chapters of this book, hopefully, the clinician placing and restoring implants can vicariously, and less painfully, receive some valuable experience.

Moreover, the different authors will present this information from various aspects of their clinical experience. This should result in more comprehensive understanding of a problem and its treatment.

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References


