STEFAN WOLFART

IMPLANT PROSTHODONTICS A PATIENT-ORIENTED STRATEGY

PLANNING | TREATMENT PROCEDURES | LONGEVITY | ESTHETICS | FUNCTION | DENTAL TECHNOLOGY

CONTRIBUTORS SÖNKE HARDER, SVEN REICH, IRENA SAILER, VOLKER WEBER



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Berlin, Chicago, Tokyo, Barcelona, Istanbul, London, Milan, Moscow, New Delhi, Paris, Prague, São Paulo, Seoul, Singapore and Warsaw

Foreword to the English edition

Brånemark's introduction of a scientifically viable osseointegration technique dramatically changed the treatment dynamic for patients needing prosthodontic management. Prior to the seminal 1982 Toronto Symposium and the 1985 publication of Tissue-Integrated Prostheses: Osseointegration in Clinical Dentistry, prosthodontists around the world had already demonstrated impressive evidence of employing different techniques and methods to compensate for tooth loss, including pre-prosthetic surgery. However, several routinely prescribed clinical interventions - especially complex ones - were long on mechanical ingenuity but short on robust biological outcome documentation. Adverse intraoral ecological changes were frequently encountered with prescribed treatments, as a range of inherent biological and mechanical risk considerations developed in the context of time-dependent outcomes.

Clinical scholars around the world had long sought simpler, versatile and, above all, minimal morbidity types of prosthetic prescriptions for patients' partial or completely edentulous predicaments. They readily recognized that a method of providing alloplastic tooth replacements via a predictably controlled healed interface would usher in an entirely new era of prosthodontic care. And more than three decades of globally driven research in the field of applied osseointegration have certainly validated the merits of employing the technique as an integral and indispensable part of the dentist's therapeutic repertoire.

The canon of literature on the topic has now been enriched even further with the publication of this text. It is a brilliant synthesis of what can and should be considered in managing prosthodontic patients' needs. I hasten to state that I regard it a landmark in publications on the topic; it is lucidly and superbly organized, wonderfully illustrated, and reflects a coherent and invaluable approach to patient-mediated concerns. Moreover, Stefan Wolfart has recruited some of Europe's best minds in the field to produce this first-rate team effort that deserves the widest circulation.

Mine was the privilege to have been a co-author and editor of the first book on osseointegration, together with P. I. Brånemark and T. Albrektsson, thirty years ago, also published by Quintessence. I must now happily acknowledge "what a difference three decades have made" in the extraordinary dental endeavor of implant prosthodontics. Professor Wolfart's team deserves sincere congratulations for this significant addition to the prosthodontic canon.

George Zarb

Emeritus Professor, University of Toronto Editor-in-Chief, International Journal of Prosthodontics

Foreword

When he applied for an assistant's position in 1998, Stefan Wolfart was different from most other candidates who compete for jobs in places where they went to college or where they want to live for other reasons. Stefan Wolfart had researched the prosthodontic departments that he felt were suitable for him and was visiting his potential employers by traveling through Germany from south to north and from west to east. To date, he is still the only external candidate who has ever asked to be allowed to sit in on one of my lectures as part of his application process. After visiting us, he continued his round trip to the end before finally deciding to accept my job offer.

For more than ten years, Stefan Wolfart and I then worked together at the Kiel University Dental School in a clinically and scientifically fruitful and inspiring partnership. During our time as coworkers, implant dentistry was always an essential part of the prosthodontic treatment portfolio offered to our patients. This period of intensive collaboration saw a clear differentiation and individualization in our implant-based prosthodontic concepts, and it makes me proud to see that a significant proportion of these concepts has now made it into this comprehensive textbook on implant prosthodontics.

At the same time, when looking through this book, I was impressed to find that Stefan Wolfart has now refined and systematically brought together the implant-based prosthodontic treatment concepts from the viewpoint of the individual patient, in a way not seen anywhere before.

After completing his Dr. med. dent. habil thesis at Kiel University in 2008, Stefan Wolfart accepted the offer of the renowned Chair of Prosthodontics and Biomaterials in Aachen, as successor to Hubertus Spiekermann. It was Hubertus Spiekermann who wrote the first illustrated atlas of implant dentistry in the early 1990s, which became a generally established standard text in widespread use.

Only six years after taking the Chair in Aachen, and about twenty years after the first publication of Hubertus Spiekermann's classic, Stefan Wolfart now presents us with an impressive all-encompassing work on implant-based prosthodontic rehabilitation. In my opinion, this book has the potential to evolve into a standard text of similar significance to that written by his predecessor – not least because the extensive, high-quality, and lovingly compiled visual material makes it highly reminiscent of an illustrated atlas, even though his textbook is not actually an illustrated atlas in the classic sense.

Over the past two decades, dental implantology has seen huge advances, and has now become an essential part of the prosthodontic treatment concept. However, patients do not ask for implants for their own sake, but only want them to provide a secure anchor for a huge variety of dental prostheses. Whereas conventional dental prostheses often fulfill their function perfectly well without implants, dental implants always have to be fitted with adequate prostheses if they are to do their job properly. It is therefore only logical that Stefan Wolfart has given the work written by him and his co-authors the title "Implant Prosthodontics – A Patient-oriented Concept." By doing so, he has brought into focus the reason patients want implants, namely to provide support for their individually required dental prostheses.

While it is true that "backward planning" has long been standard parlance in dental implantology when planning an implant, it is the merit of this book that it focuses consistenly on the optimum prosthetic treatment for each individual patient. In this context, the use of implants is not an end in itself and does not follow the principle of "the more the better"; instead, it acknowledges that, in some cases, the best possible treatment may simply be better achieved through the use of conventional treatment strategies without implants. This book is the first implant prosthodontics work to make consistent use of so-called decision trees, with their systematic consideration of all the factors pertaining to each individual patient.

I am absolutely sure that this textbook will become an outstanding aid in the daily work of all professionals involved in dental implantology, namely both dentists and oral and maxillofacial surgeons, regardless of whether they are active in implant prosthodontics, in implant surgery, or both. The reason for this is that patient orientation should always be at the focus of the treatment, and, when it comes to implant dentistry, the therapist's aim should be to ensure that the patient-tailored treatment should be more readily achievable with implants than without them.

This book will make its way, for sure!

Kiel, June 2014 Matthias Kern

Preface

In November 2008 – a month after I took over the Chair of Prosthodontics and Biomaterials in Aachen from my predecessor Hubertus Spiekermann – Johannes Wolters from the publishers Quintessenz Verlag visited me at my office, still in the process of being furnished and fitted, and asked me if I wanted to write a book about implant prosthodontics. There would be a great demand for such a work. I thought briefly about the duties that lay before me in taking over the Chair, two small children at home and a new start in a new city, smiled, and declined.

But once the idea of this as yet unwritten book first lodged in my brain, I could not stop thinking about it. Instead, more and more reasons emerged why such a volume would represent an important piece in the puzzle of the current literature in dentistry. In January 2010, I agreed to write it.

The 2,000 clinical images, taken from an archive of around 40,000 photographs, provide one of the key didactic pillars of this book. My special thanks here go first to the patients who agreed to undergo this extra inconvenience and effort, and also to the dental assistants, without whose support such a documentation would not have been possible. In this respect, I would like to extend my personal thanks above all to Ms. Nicole Pollmann from Kiel and to Ms. Svenja Fröhlich from Aachen. A small, but at the same time important, detail is the background used in these photographs: the pink backdrop represents the patient cases from Kiel, who were treated from 1998 to 2008. The gray and white background indicates the cases from Aachen in the period from 2009 to 2013.

Successful, high-quality implant dentistry and implant prosthodontics is possible only with a team that works well together. Here, I would particularly like to thank Franz Härle, Hendrik Terheyden, Jörg Wiltfang, and Frank Hölzle in the field of oral and maxillofacial surgery. Without their expertise and the very close collaboration we enjoyed, many of our patients could not have been rehabilitated according to the concept presented in this book. Dental technicians are also essential partners in this cooperative effort. I want to extend my express thanks to Master Dental Technicians Stefan Horn, Volker Weber, Matthias Hasselberg, and Tomonari Okawa, as well as Dental Technicians Reinhard Busch, Raphael Gerhardt, and Britta Schlüter, for their enormous dedication and countless discussions, ideas, and suggestions.

In view of the meteoric advances in implantology and implant prosthodontics, this book could not have been realized at this level of complexity without the help and support of the four specialists who were also involved in its creation. One of these is Sven Reich, who possesses a profound knowledge of digital dentistry. Our many years as work colleagues in Kiel link me to Sönke Harder. As an expert in the areas of guided implant placement and implant/abutment joints, he has provided significant input for this book. Irena Sailer is currently one of the most important scientists involved in the clinical testing of all-ceramic materials, and brings with her a contribution on all-ceramic abutments. Volker Weber realized the dental technology aspects of many of our joint patient cases, documented these cases in detail, and communicated the process involved in several of this book's chapters. These dental technology chapters fill a particularly important gap in the current literature. They show dentists what dental technicians need to do to produce a finished restoration, and also embed the work of both groups of professionals into a joint concept in a clear and comprehensible way. This can only be realized as part of an interactive process and should be interpreted as a connecting link between the individualists that we find here and there in both professions.

I am also greatly obliged to Christoph Bothung for his brilliant studio photographs and for his contribution to the chapter opening pages. In addition, I would like to thank my senior resident Walter Mautsch and my friend Dominik Groß, for proofreading the manuscript and for their comprehensive, constructive criticism. Further, I want to express my appreciation for the invaluable support of Shaza Bishti for the correction of the English version.

My special thanks go to my long-term mentor and friend, Matthias Kern, without whom this book simply would not have come into being.

My final and most important thanks go to my wife Mona and my sons David and Jonathan for their ungrudging willingness to cope with my frequent absences, for giving me so much support in all that I do, and for constantly motivating me to bring this project to a successful conclusion.

Aachen, June 2014 Stefan Wolfart

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Prof. Dr. med. dent. Stefan Wolfart is Director of the Clinic for Prosthodontics and Biomaterials of the University Hospital RWTH Aachen, and holder of the eponymous Chair of the Faculty of Medicine at the RWTH Aachen University.

After finishing high school (1988) and completing the mandatory young men's social service (1989-1990), he graduated from the Philipps University of Marburg (degree in Dental Medicine 1995, Dr. med. dent. 1998). During his undergraduate studies, he was admitted to the prestigious German National Academic Foundation (1993). After his graduation, he joined an independent practice near Cologne (1997). He then worked as a research assistant at the Department of Prosthodontics, Propaedeutics and Dental Materials at the Schleswig-Holstein University Hospital, Campus Kiel (1998-2008), where he was appointed senior resident in 2000. In 2001, he was certified as a "Specialist in Prosthodontics" by the German Society for Prosthetic Dentistry and Biomaterials (Deutsche Gesellschaft für Prothetische Zahnmedizin und Biomaterialien, DGPro). In May 2006, he gained his postdoctoral teaching qualification ("Habilitation"), and in October 2008 was appointed to the tenured Professorship in Prosthodontics and Biomaterials at the Faculty of Medicine at the RWTH Aachen University. Dental implantology and implant prosthodontics have been his primary areas of clinical activity for many years. Prof. Wolfart's main areas of research, apart from implantology and implant prosthodontics, include dental esthetics, the clinical performance of new all-ceramic materials, and their associated improvement in quality of life. He is a certified implantologist with the German Association of Oral Implantology (Deutsche Gesellschaft für Implantologie, DGI) and a Fellow of the ITI (International Team for Implantology).





Priv.-Doz. Dr. med. dent. Sönke Harder is an independently practicing dentist at the Clinic for Dental Medicine and Implantology in Munich, Germany, and Associate Professor in the Department of Prosthodontics, Propaedeutics and Dental Materials at the Christian Albrechts University of Kiel.

Having graduated from high school (1997) and finished his military service (1997-1998), Sönke Harder completed a degree in Dental Medicine at the Christian Albrechts University of Kiel (Dentistry Examination 2004, Doctorate in Dental Medicine 2005) with a study stay in Switzerland (Lucerne Cantonal Hospital). He began his dentistry career as an assistant in independent practice in Hamburg. After this, he worked as a research assistant/dentist in the Department of Prosthodontics, Propaedeutics and Dental Materials at the Christian Albrechts University of Kiel (2005-2007). In 2007, Dr. Harder moved to the Polyclinic for Prosthodontics at the university hospital of the Ludwig Maximilians University of Munich, but returned to Kiel in the same year and was appointed senior resident there in 2009. In 2010, he left the Polyclinic and set up the Clinic for Dental Medicine and Implantology in Munich, jointly with Priv.-Doz. Christian Mehl, Doctor of Dentistry. He then gained his postdoctoral teaching qualification at the Christian Albrechts University of Kiel in 2013.

Dr. Harder's main areas of clinical activity include augmentation surgery and implant prosthodontics. In his research work, he focuses on the biomechanical properties of dental implant systems. Dr. Harder is a Specialist for Prosthetics of the German Society for Prosthetic Dentistry and Biomaterials (DGPro) and a certified implantologist with the German Association of Oral Implantology (DGI). **Prof. Dr. med. dent. Sven Reich** is Professor for Education and Research in the field of Computerized Dentistry at the Clinic for Prosthodontics and Biomaterials, Center of Implantology (Head: Prof. Dr. S. Wolfart), Faculty of Medicine, University Hospital RWTH Aachen, Germany.

Sven Reich studied Dental Medicine at the Friedrich Alexander University of Erlangen-Nuremberg from 1989 to 1994. From October 1994 to November 2005, he worked as a research assistant at the Polyclinic for Prosthodontics of the University of Erlangen-Nuremberg. He gained his doctorate there in 1997. After being awarded his postdoctoral lecturer qualification in Erlangen in 2005, he took a position at the Polyclinic for Prosthodontics and Materials Science of the University of Leipzig in December of the same year. In October 2009, he moved to the Clinic for Prosthodontics and Biomaterials of the Aachen University Hospital. Since July 2012, he has been a tenured W2 Professor.





Prof. Dr med. dent. Irena Sailer received her dental education and Dr. med. dent. degree from the Faculty of Medicine, University of Tübingen, Germany, in 1997/1998. From 1998 to 1999, she did her post-graduate training in Oral Surgery at the Clinic for Oral Surgery, School of Dental Medicine, University of Zurich, Switzerland. In 1999, she started her post-graduate studies in Prosthodontics at the Clinic for Fixed and Removable Prosthodontics and Material Sciences, University of Zurich, Switzerland.

From 2003, Dr. Sailer was Assistant Professor at the Clinic for Fixed and Removable Prosthodontics and Dental Material Sciences in Zurich. From 2010, she was Associate Professor at the same clinic. In 2007, she was Visiting Scholar at the Department of Biomaterials and Biomimetics, Dental College, New York University, USA. Additionally, since 2009, she has held an Adjunct Associate Professorship at the Department of Preventive and Restorative Sciences, Robert Schattner Center, School of Dental Medicine, University of Pennsylvania, Philadelphia, USA (Director: Prof. Dr. M. B. Blatz). Since September 2013, she has been the Director of the Division of Fixed Prosthodontics and Biomaterials at the University of Geneva, Switzerland.

Dr. Sailer is a specialist in prosthodontics (Swiss Society of Reconstructive Dentistry) and in oral implantology (WBA Swiss Society of Dentistry). She is a Fellow of the International Team for Implantology (ITI), an active member of the European Academy of Esthetic Dentistry (EAED), and a Fellow of the Greater New York Academy of Prosthodontics (GNYAP). Master Dental Technician Volker Weber is an Executive Partner of the Impladent dental laboratory in Aachen, which he manages together with his business partners and fellow Master Dental Technicians, Ralf Ommerborn and Ralf Wachelder.

Volker Weber did his professional training from 1983 to 1987, after which he worked at a variety of laboratories. His already established contact with the Clinic for Prosthodontics and Biomaterials of the RWTH University Aachen (headed up at that time by Prof. Dr. Dr. Dr. h.c. H. Spiekermann) became closer after he began working at the newly formed Impladent dental laboratory. In 1994/95, he passed his Master Dental Technician's examination at the "Meisterschule zu Köln," a school for master craftspeople in Cologne. Apart from his collaboration with dentists in independent practice, his very close working relationship with the Clinic for Prosthodontics and Biomaterials, Center for Implantology has also continued under the new directorship of Prof. S. Wolfart since 2009.

In addition to his dental technology work, Volker Weber has been involved in a number of publications and holds a variety of lectures on the subject of implant-supported superstructures. Since 2005, he has acted as advisor for the continuing education series "Implant Prosthodontics in Dentistry and Dental Technology," certified by the German Association of Dental Implantology (DGZI) and, since 2008, has also acted as advisor for the joint DGI and APW (Practice and Science Academy of the German Society of Dental, Oral and Orthodontic Medicine, DGZMK) curriculum "Implant Prosthodontics and Dental Technology."

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Chapter 1 INTRODUCTION

S. Wolfart

1.1 The implant prosthodontist as architect

The work of dentists involved in implant prosthodontics and the work of architects both have an important aspect in common – the need to plan and coordinate.

Let us take a closer look at this aspect. Clients come to an architect with certain ideas about their new home. The architect discusses their needs and desires with them and works out the key points, such as the size of the land required, the construction requirements, and the financial considerations. The architect then plans the building and modifies the plans until the best possible compromise is achieved between the client's wishes and the underlying circumstances and limitations. Thereafter, the implementation of the plans is discussed with the various construction professionals and workers in order to realize the construction of the building. The plans drafted by the architect form the basis for the intercommunication between the various members of the building team.

If we apply this analogy to the business of fitting patients with implant-borne dental prostheses, the dentist takes on an architectonic planning and coordination role by analyzing the patient's requirements and taking into account the dental, periodontal, and functional situation at baseline. The dentist will also look at the functional and esthetic needs and desires of the patient, and consider any risk factors that may be applicable. The patient's financial resources will also be taken into consideration. Having done all this, and with due regard to the latest available scientific evidence, the dentist will plan the best dental prosthesis to fit the patient.

These creative, architectonic services are followed by the coordination of the treatment, with the aid of the "architectural plans" that the dentist has drawn up; namely, the wax-ups/setups, the provisional restoration, the augmentation template, and the surgical guide. Any dental specialists who may be needed – periodontists, endodontists, and surgeons – are consulted, as required.

The patient will then undergo conservative and periodontal pretreatment by the dentist and/or specialist. It is only then that the "foundations" are laid, in the form of any augmentation measures that may be needed, the implant surgery itself, and the procedure to uncover the implant(s). To ensure effective collaboration with the specialist, it may make a lot of sense for the dentist who will later provide the prosthetic restoration to be present during any surgical procedures. This would avoid any miscommunication between the prosthodontist and the surgeon, and make the patient feel particularly safe and secure. Once the prosthetic restoration has been completed, it is a good idea to arrange a final meeting between the dentist, surgeon, and dental technician. This provides an opportunity for all team members to discuss the treatment outcome and find solutions to any problems that may have arisen. Consequently, the entire implant therapy project is subject to constant fine-tuning within the team. Finally, the patient is included in an aftercare program. Depending on the patient's risk profile, the recall appointments will take place at intervals of 3 to 12 months. Figure 1-1 shows the full course of this process.

1.2 Structure of this book

To do justice to the responsibilities and duties involved as planner and coordinator of the implantology project, the dentist does not necessarily need to be equally competent in all the areas involved, but needs to be able to demonstrate a broad, basic understanding of implantology and implant prosthodontics in order to draw up a target-oriented analysis of the situation. This book introduces various "profiles" for this purpose, in which all the relevant factors pertaining to a particular issue are brought together, subjected to a scientific analysis, and structured using a problem-centered design. These profiles include:

- The patient profile
- The esthetics profile
- The dental prosthesis profile
- The implant-abutment profile
- The profile relating to the implant surgery and implant loading times
- The emergence profile

In Part B of this book, these six profiles are interwoven into patient-oriented flowcharts, leading to the development of "decision trees" that allow the dentist to find the best possible treatment for each individual patient.

Part C provides a comprehensive presentation of all the necessary treatment steps and weighs up the various options against one another. The conclusion to each chapter includes a summary of the measures that promise to deliver the best results in various situations. In this respect, the book makes no claims of completeness, but aims instead to present a logical, exemplary concept based on scientifically underpinned treatment measures.

In Part D, the assessment-oriented flowcharts are used to present each potential form of treatment in a step-by-step manner, from baseline to aftercare, using an actual patient case as an example. This allows readers to gain a clear understanding of the correct treatment procedures and to apply them safely to their own patients.

In Part E, the implant-based prosthodontic reconstructions are examined specifically with regard to the challenges of dental technology. Once again, a step-bystep approach is used to communicate how the individual reconstructions can be realized technically. Many of the prostheses used as examples are discussed from the dentist's point of view in the preceding chapters.

1.3 Implant prosthodontics – challenges and conflicts

A book about implant prosthodontics making the above claims will be exposed to five points of criticism that require discussion:

- 1. Dentists already know how implant prosthodontics works.
- 2. Implant-borne prostheses are exactly the same as conventional, tooth-borne prostheses. Therefore, they do not need a dedicated textbook.
- 3. There are insufficient research studies available to permit high-level scientific discussion of the topic.
- 4. Treatment strategies change so quickly that it is impossible to write a book that remains up-to-date.
- Every implant system functions differently, so that it is only possible to write a system-specific – and therefore necessarily industry oriented – textbook.

Re 1: One recurring theme at conferences and training events involving implant prosthodontics is that dentists want a tried-and-tested, consistent treatment concept for implant prosthodontics that is scientifically substantiated and can be implemented sequentially. These practitioners repeatedly ask pertinent questions, the answers to which have not yet been incorporated into a coherent treatment concept. Examples of these questions include: Should restorations be screw- or cement-retained? How many implants does my patient need? How important is platform switching?

Re 2: It is true that crowns, fixed dental prostheses (FDPs), and removable dental prostheses (RDPs) are also used in implantology. However, an implant treatment is much more complex than treatment with conventional dental prostheses. "The planning of extensive implant-borne prosthetic restorations in particular presents the dentist with far greater professional as well as organizational dental prostheses. In conventional dental prostheses, the





treatment is guided primarily by the prevailing conditions for which the clinician is not responsible, such as the number and location of the abutment teeth and the denture-supporting area. When a dentist provides implant-borne restorations, the future prostheses and the three-dimensional positioning of the implants need to be planned in advance with great precision. Any surgical augmentation procedures need to be factored in to allow the desired esthetic and functional rehabilitation to be achieved. Such complexity considerably increases the dentist's responsibility" (Strub et al³⁶², p. 926). This requires standardized coordination of the various treatment processes between all those involved.

Re 3: Currently, the study data for implantology may be described as good enough to provide adequate scientific evidence for suitable treatment concepts. However, it is difficult to exclusively recommend methods with posi-

tive 10-year data. If one is satisfied with shorter periods, many of the concepts are reasonably well substantiated, while others can definitely be ruled out.

Re 4: An examination of the changes in treatment concepts over the past 15 years reveals a "conservative" approach that has changed very little, along with "novelty" treatments, some of which have undergone rapid change, many others of which have vanished altogether. Given this situation, it is a huge challenge to find the right mixture of a safe as well as modern treatment concept.

Re 5: It is true that most implant systems differ in their details. Nevertheless, they all have similar basic principles. If these principles are adhered to, dentists should be able to apply the case examples in this book to their own implant systems.

Chapter 2 PATIENT PROFILE

S. Wolfart

Substantiated data from clinical studies are now available regarding the efficacy of a majority of implant treatment methods. These findings allow clinicians to find the best possible form of therapy for their patients. The available treatment methods have reached a high standard, and result in pain relief and the restoration of function and esthetics.

Implant prosthodontics applies particularly to esthetics, since the ideal restoration from the patient's point of view can be achieved using this approach, particularly if fixed prostheses are used. Patients are particularly happy about this improvement, since their oral health-related quality of life would often have been greatly impaired by the gaps in their teeth.

However, implant-borne removable dentures present a different picture: these cannot restore the original situation to the same extent, so the patient will need to tolerate certain restrictions. Although such restrictions may be reduced by the number of implants and the type of superstructure used, they can never be completely avoided.

In addition, an approach using removable prosthetic restorations is often disadvantaged by the lack of evidence-based data that would allow the clinician to consider the best treatment option (eg, for the edentulous maxilla). For instance, there have been no high-quality scientific studies to test the restoration concepts of implant-supported telescopic crowns³⁸¹ or modern ball-attachment systems. In this context, only data on bar overdentures are available³⁴³. Moreover, it is rare for two forms of treatment to have been compared systematically in a randomized study conducted over a long period. This evidence gap opens up a wide "therapy corridor" within which the correct treatment must be selected to fit the individual patient. Each of these different forms of treatment brings with it certain advantages and disadvantages that need to be reconciled with the individual baseline situation (eg, bone resorption), the risk factors that apply to each patient, personal preferences, the patient's anxieties and resilience, and the time that the patient is able to spend going to the dentist.

2.1 Patient personalities

The situation outlined above highlights the importance of the patient as an individual with regard to the best treatment decision in each specific case, prompting the need for a closer look at different patient personalities. In this context, in his 2010 paper entitled "What do people expect from the healthcare system?", Wippermann showed that individual groups, even entire populations, have a very different understanding of health, and that they differ accordingly in their patterns of health-related behavior (Wippermann⁴⁰¹, p. 95–107):

"The diversity is even greater when it comes to an individual's own or subjectively perceived health: this variety of lifestyles leads us to conclude that the willingness to do something for one's own health or to take health risks in favor of consumption, varies greatly within the population. [...] not only the characteristics of social status (gender, income, education, occupation, workplace, area of residence etc.), but also values (preferences, interests, attitudes) and lifestyles (daily routines, rituals, social relationships)" play an important role in this respect.

"Humans in their various 'lifeworlds' (subjectively experienced living environments or milieus) possess a very different material, social and cultural capital, which in itself affects their understanding of health. [...] The following deliberations concentrate on three 'lifeworlds'. [...] The *conservative* and those who are *traditionally rooted* possess a similar basic orientation in life (the same value axis), but a different social status. The *traditionally rooted* and *consumerist materialists* have a similar social status (in the upper and middle strata), but a different underlying orientation (traditional vs. modern) [...]:

"Conservatives have a holistic, humanistic concept of health – and continue to work actively to keep that concept complete and multidimensional. Conservatives care about spiritual, physical and social vitality, about self-determination in their own lives (also in old age). Their philosophy of life and health is that of moderation in everything. Enjoyment and health are inextricably bound and must be in balance with one another: 'I maintain a certain lifestyle which keeps me healthy in mind and body.' [...]

- "In stark contrast to the conservatives, a standard subject for the *traditionally rooted* is a daily, lengthy and detailed litany about various complaints, aches and pains, recent or upcoming visits to the doctor (involving themselves, family members and neighbors). Most are now pensioners following a long working life, and many have taken early retirement. Their jobs are or were physically demanding, such as skilled and unskilled craftsmen and laborers. They are characterized by an occupationally driven need for physical robustness, and their predominant perspective is that of physical function. In contrast to the conservatives, health is focused on physique. In this context, it is seen as normal for there to be some 'wear and tear' [...].
- People whose milieu lies at the lower fringes of society do not place great value on health. They are much too weighed down by worries about how to manage day by day: money worries, making ends meet, not being ostracized by others, constantly having to communicate with people of better standing (at school, the office, bank, doctor's practice) in the knowledge that they will be more or less blatantly disregarded or treated with scorn by these individuals. [...] The normal, default worldview is that every person has a basic level of health that will 'last' for a certain length of time during their lifetime."

These three milieu descriptions by Wippermann give us some insight into how one should approach and counsel patients differently. Dentists will only really reach their patients if they speak their language, and make what they say accessible to them. Moreover, dentists need to grasp that patients will take whatever they have perceived back into their own world (family and friends), where their arguments will also need to be understood. In concrete terms, this might translate into the following scenario: only if a wife can make the need for the planned treatment plausible to her husband, and can explain the arguments communicated to her by the dentist, will she succeed in achieving family consensus for the additional costs that will have to be met, for any downtime affecting her contribution to the household, etc

2.2 Developing the patient profile

Since implant treatment has certain special features, the dentist should attempt to get a clear picture of the patient. Implant therapy is purely elective and is always associated with surgical procedures, complex treatment courses, prolonged treatment periods, and additional costs. However, what can be achieved is an improvement in masticatory function, with the potential added benefit of not having to use removable dentures, as well as improved orofacial esthetics.

In order to find the appropriate treatment strategy together with the patient, the dentist needs to use the consultation phase to analyze various individual patient-related factors. These will impart valuable information regarding the subsequent decision-making process. These factors include:

- 1. The patient's financial resources.
- 2. Functional requirements for the dental prostheses.
- 3. Willingness to undergo invasive procedures.
- 4. Demands regarding the esthetic outcome.
- 5. Individual implant-loss risks:
 - a. Personal risk factors that could influence the longterm performance of the implants.
 - b. The patient's willingness to cooperate (oral hygiene).

An overview of all these individually weighted patient factors provides the patient profile, whereby each factor alone may represent an exclusion criterion from implant treatment, regardless of how the other factors are weighted.



Fig 2-1 The decision tree: Starting from a specific gap profile, different planning variants arise for the dental prosthesis profile (example 1 to 3) with regard to dental technology design, the number of implants needed, certain technical details, the degree of difficulty for the clinician, and scientifically confirmed long-term performance. Each planning option, in turn, fits in with certain characteristic patient profiles.

2.3 Decision trees

Apart from the patient profile, two other important profiles play a key role in the treatment planning. (1) The gap profile, which describes the size of the edentulous segments of the dental arch and takes into account any existing soft and hard tissue defects. (2) The prosthetic profile, which defines the specifications for the various tooth-replacement options (Fig 2-1).

A specific gap profile results in a variety of planning variants for the prosthetic profile. These variants differ with regard to technical design, the number of implants needed, certain technical details, the degree of difficulty for the clinician, and scientifically confirmed long-term outcome. Each planning option, in turn, fits in with certain characteristic patient profiles. Thus, given a specific gap profile, the decision tree derived from it helps the dentist to find the implantological/ dental/technical restoration concept that best fits the individual patient. These decision trees are presented in Chapter 9. Various individual gap profiles are presented in Chapters 21 to 24.

2.4 Principal factors of the patient profile

2.4.1 Financial leeway

This point needs to be determined based on the patient's social situation, insurance cover, and concrete statements. After an initial estimate of the treatment costs, the preliminary assessment can always be adjusted by means of a detailed estimate and schedule for the treatment. In this context, the dentist needs to remember that quotations that exceed the patient's (declared) means lead to a loss of confidence in the clinician and may result in the patient changing dentist.

2.4.2 Function

Functional aspects are assessed through targeted questions by the dentist, such as: Are you currently managing with the existing shortened dental arch? Can you eat everything with your teeth at the moment? What are your wishes for your teeth as regards improved chewing? This factor is assessed subjectively, based on the patient's answers.

2.4.3 Esthetics

The patient's ideas about the esthetic outcome of the treatment can also be assessed through targeted questioning by the dentist. This involves addressing any esthetic deficits that already exist, such as: Are you bothered by the exposed crown margins/the differently colored or dark teeth/the uneven line of the incisal edges/the unbalanced proportions of your teeth? This factor is also assessed subjectively, based on the patient's answers.

2.4.4 Resilience

This refers to the ability of the patient to cope with the treatment. Since most patients do not know much about the surgical procedures performed in dental implantology, this point can be explained by means of a general description of the duration and invasiveness of the procedure, and by explaining the likely nature and duration of the postoperative symptoms and discomforts. Subjective assessment of this factor should also include the patient's age and morbidity, along with any additional measures that may affect the procedure, such as anticoagulant treatment.

2.4.5 Individual risk of implant failure

To assess the risk of implant loss for each individual, it is necessary to analyze the patient's medical history for certain general disorders and predisposing factors. Being over the age of 60, being a smoker, being diabetic, and having a history of radiotherapy to the head and neck region are considered to be risk factors for early implant loss²⁷⁶. The poor data currently available in this regard do not provide a reliable answer to the question of whether other general medical disorders lead to an increased risk of implant loss. Similarly, no definitive data are available as regards existing osteoporosis²⁷². Particular attention needs to be paid to any past or planned bisphosphonate therapy (see Chapter 8.2).

In addition to implant loss, peri-implantitis is a particularly critical biological complication that also needs to be considered in this context. The prevalence of peri-implantitis has been quoted as 10% of implants and 2% of patients over a period of 5 to 10 years after implant placement²⁷³. Smoking, poor oral hygiene, and prior periodontitis lead to increased prevalence²¹³.

Due to the increased risk of peri-implantitis in patients with poor oral hygiene, this should be regarded as a contraindication when it comes to implants. A well-structured aftercare program is also recommended to reduce the rate of biological and technical failures of fixed implant-retained restorations³⁰¹. An attempt should therefore be made to assess the patient's cooperation before the treatment begins. This involves assessing the current hygienic status of the teeth, the patient's participation in previously offered aftercare programs, and the plausible use of additional oral hygiene aids, such as dental floss and interdental brushes. If the initial result is unsatisfactory, it is essential to make every effort to achieve an improvement during the pretreatment phase.

It can be concluded that the factor of individual risk of implant failure is made up of a number of subfactors and forms part of the patient profile. Figure 2-2 gives an overall view of the two complexes that make up the patient profile.

2.4.6 Representing the patient profile

Each of the five factors of the patient profile discussed above is shown in Figure 2-3. Each factor has a rating scale that is divided into four levels, shown as a color strip ranging from low to high. This diagram reduces an extremely complex construct to the parameters that are important for case planning, allowing them to be assessed at a glance.



Fig 2-2 The patient profile. The following factors configure the patient profile: financial resources, esthetic requirements, functional requirements, and willingness to undergo invasive measures. These four factors interact with a fifth factor, the individual implant-loss risk, which comprises a number of subfactors.



Fig 2-3 The five factors of the patient profile, each with a rating scale ranging from low to high (color strips).

2.5 Practical significance of the patient profile using a patient case example

2.5.1 Constructing the patient profile

A retired judge – exhibiting a conservative value orientation according to Wippermann – presented at the age of 70 with the baseline situation shown in Figures 2-4 to 2-7. When asked what brought him to the clinic, he replied: "My dentist wants to grind down all my teeth and make me a nice new set. But people have known me for years just as I am. I don't want any other teeth. Aren't there any alternatives?"

The patient's general medical and dental history was then discussed with him. This revealed no evidence of risk factors that might negatively influence an implant treatment. After a joint analysis of his smile and masticatory function, it was confirmed that he would like to retain the current appearance of his teeth. He was also managing well with the masticatory function of a shortened dental arch on both sides. However, the interim mandibular prosthesis that he had already been wearing for 2 years was perceived by him as troublesome. When asked why he had undergone further restoration in the past 2 years, he made it clear that he cared about keeping his own teeth above all else, and that his dentist had not put forward any satisfactory suggestions about how to resolve this. In this context, he also stated that he would be very willing to undergo minor surgical procedures if he could be convinced that there was no better alternative. Moreover, he would far rather avoid a removable prosthesis as he would otherwise appear "so old" in his art history course, where he is currently completing his fourth semester. Finally, he also indicated that costs were only a secondary consideration; after all, during his career as a judge he had seen a lot of treatment failures, which he wished to avoid for himself.

This initial consultation lasted 20 minutes and left the clinician with the following impression as regards the patient profile:



Fig 2-4 Patient with a conservative value orientation.



Fig 2-5 Baseline situation: shortened maxillary dental arch.



Fig 2-6 Baseline situation: edentulous areas in the mandibular dentition.



Fig 2-7 Detailed view of the anterior mandible.



Fig 2-8 The individual patient profile of the example patient.

Finances: Since the patient comes from a conservative milieu, is privately insured, and explicitly admits that "costs are only a secondary consideration" for him, his financial leeway was rated as high (Level 3) in the patient profile (Fig 2-8). Of course, this initial assessment could turn out to be incorrect; following the preliminary estimate, it may need to be amended with a detailed estimate and schedule for the treatment.

Function: As the patient is "managing well" with a shortened dental arch on both sides, and appears to be in no great distress, he was rated as being fairly undemanding. This also correlates with the fact that, while he describes his current interim prosthesis as "troublesome," he has nevertheless been wearing it for years and appears to be managing with it quite well. This resulted in a low (Level 1) rating.

Esthetics: In the dentist's understanding, the patient has formulated no great demands on this point. He does, however, define a highly individual stance, which a dentist should respect and comply with as far as is medically possible. Both of these aspects were evaluated, which resulted in a moderate (Level 2) rating.

Resilience: Based on what the patient has said about his willingness to undergo surgical procedures, his resilience was assessed as moderate (Level 2).

Risk of implant failure: Apart from the existing extensive periodontitis, no other risk factors are apparent from the medical and dental history. The patient's cooperation may also be assessed as good, since he presented with teeth that have been well cared for, and said that he had visited his previous dentist for his scheduled 6-monthly preventative care appointments. Therefore, this factor was also given a low (Level 1) rating.

These considerations define the individual patient profile shown in Figure 2-8.

2.5.2 Planning and treatment based on the patient profile

The completed assessment confirmed the diagnosis of generalized extensive periodontitis (Fig 2-9). Prognostically, teeth 15, 13, 23, 25, 34, 33, 43, 45, and 47 were classified as "reliable" (green), and teeth 14, 12 to 22, 24, 32, and 42 as "doubtful" (yellow); however, none of the teeth were classified as "not worth preserving" (red) (see Chapter 8.4). The dental arches in the first, second, and third quadrants were shortened. Teeth 31 and 41 were missing. Taking into account the patient profile, a treatment concept was developed together with the patient. Thereafter, the patient discussed the arguments for the suggested treatment with his wife, herself a physician. Although this discussion reinforced the patient's decision, it resulted in some questions regarding the risk assessment of the planned treatment. Once these questions had been resolved during a second consultation appointment, the patient consented to the implementation of the following treatment plan:

1. Periodontal treatment will be performed in the maxilla and mandible, with the aim of preserving all the teeth that are present. This is to be followed by adhesive splinting of the teeth with a fiberglass mesh (Ribbond) for added stabilization of the maxillary teeth (Figs 2-10 and 2-11).



Fig 2-9 The panoramic radiograph showing generalized extensive periodontitis. The teeth have been classified into the prognostic categories of "reliable" (green), "doubtful" (yellow), and – though not applicable here – "not worth preserving" (red).



Figs 2-10 and 2-11 Maxilla following periodontal treatment and Ribbond splinting.

- This tooth-preservation treatment will make it possible to comply with the patient's request that there be no change in his esthetic appearance, while his teeth be permanently stabilized. It does not seem necessary to replace the molars, since the patient perceives his masticatory function as adequate despite the abbreviated dental arch.
- 2. Two implants will be placed in the third quadrant, with circumscribed bone augmentation (Figs 2-12 to 2-14) and the implants loaded with single crowns.
- 3. The anterior missing teeth will be restored with two anterior cantilevered all-ceramic resin-bonded fixed dental prostheses (FDPs) (Figs 2-15 and 2-16).
- 4. The space in region 44 will be restored with a cantilever FDP from teeth 47 to 44.
 - ► A removable prosthesis can be avoided with these treatment measures. All the mandibular teeth can

be preserved, none of the teeth need to be prepared any further, and the number of implants and augmentations required can be reduced to a minimum. Therefore, the treatment will comply with the patient's wish for minimal invasiveness.

▶ In view of his milieu classification, the patient can be given differentiated information about the prognosis of the overall rehabilitation, which is difficult to assess due to the many doubtful teeth.

Figure 2-17 shows the prosthetic restoration directly after insertion. The patient was then put on a 3-monthly aftercare program. The situation after 5 years can be seen in Figures 2-18 to 2-20. The restoration has now been unchanged *in situ* for more than 10 years, and the patient has been very satisfied with it during this period.



Figs 2-12 and 2-13 In the third quadrant, implants were inserted into regions 35 and 36. The circumscribed bone augmentation was performed with a 1–1 mixture of autologous bone and Bio-Oss. The augmentation was covered with a Bio-Gide membrane fixed into place with absorbable pins.



Fig 2-14 Postoperative radiograph.



Fig 2-15 Anterior cantilevered all-ceramic resin-bonded FDP with zirconia framework.



Fig 2-16 Integrated resin-bonded FDPs following cementation.



Fig 2-17 Prosthetic restoration: implant-supported individual crowns in the third quadrant, cantilevered all-ceramic resinbonded FDPs in the anterior region, and tooth-supported cantilevered FDP in the fourth quadrant.



Fig 2-18 Anterior cantilevered all-ceramic resin-bonded FDPs after 5 years *in situ*, with progressive recession around tooth 42.



Fig 2-19 Follow-up radiograph of the anterior cantilevered all-ceramic resin-bonded FDPs after 5 years with stable bone situation.



Fig 2-20 Follow-up radiograph of the implants after 5 years, also with stable bone situation.



Fig 2-21 Alternative, fictitious patient profile. This profile would automatically lead to a different overall treatment concept.

2.5.3 Alternative patient profile

To emphasize how important it is to involve the patient in the treatment decision-making process, and how helpful the patient profile can be when doing so, a fictitious new profile has been constructed (Fig 2-21). If one assumes that the patient was highly dissatisfied with the shortened dental arch from a functional point of view, was insistent on a marked improvement in esthetics, and wanted a scientifically proven restoration for the next 10 years, the available therapy corridor would have looked very different.

In this profile, a possible treatment option would have been to extract the doubtful teeth 12 to 22, as well as teeth 32 and 42. The maxilla could then have been restored with a double crown-retained RDP fitted over the remaining maxillary teeth, while the missing teeth 31 and 41, as well as the free-end situation in the third quadrant, could both have been treated with two implants and FDPs.

Chapter 3 ESTHETIC PROFILE

S. Wolfart

3.1 Smile analysis as part of implant planning

The attractiveness of the face significantly influences the development of a person's self-image, social acceptance, self-awareness, and self-confidence^{37,56,119,212}. People who are not satisfied with the appearance of their faces cite dissatisfaction with the appearance of their teeth more often than any other feature⁵⁶.

The psychosocial effect of an appealing smile and its heneficial influence on self-worth have been emphasized in many studies^{71,136,139,256}. An attractive smile with well-positioned teeth has a positive effect on overall personal appearance^{108,109}. Thus, veneers with optimized esthetics can produce a decisive improvement in patients' quality of life and enhance their self-esteem⁹¹. Due to the significance of an esthetic and harmonious smile and its influence on quality of life, the last few years have seen a progressive increase in the efforts of dentists to provide their patients with esthetically pleasing dental restorations that also appear as natural as possible.

For the patient to whom dental esthetics is important, the key point is whether the overall appearance of the smile is consistently pleasing. In other words, it would make little sense to plan an anterior tooth implant while failing to change any neighboring teeth exhibiting unfavorable colors, unbalanced proportions, exposed crown margins, and/or unsatisfactory pontics. This would mean that the patient would get a functional solution but would remain dissatisfied with the overall impression of the smile.

Consequently, this chapter deals with the esthetic analysis of the smile, which can then be used as the basis for developing an overall treatment concept for the patient. To this end, the chapter is divided into two parts. The first part is a general exploration of dental esthetics, the patient's smile, and any teeth that may need to be restored. The second part focuses on aspects of dental esthetics of relevance to implant prosthodontics. The points covered are then summarized in an esthetics checklist⁴⁰⁹. Of course, similar planning aids are already available in the literature on esthetic dentistry. Two that are worthy of mentioning are the 12 relevant points summarized by Belser³¹, and the guide for the esthetic assessment of the patient situation developed by Chiche and Aoshima⁷⁷. The difference between these two approaches lies in the fact that Belser³¹ has examined very concrete points and has laid down clear guide values for them. Specifically, they include the following: gingiva condition, interdental spaces, dental axis, balanced gingiva line, height of the interdental contact point, dental proportions, tooth shape, characterization, surface structure, and color. Conversely, in their checklist, Chiche and Aoshima⁷⁷ include the patients' esthetic objectives, a very detailed choice of colors, and what they term "smile design." Depending on the desired outcome of the planned restorations, this smile design consists of the following categories: alignment, brightness, character, and incisal effect. These categories set new focal points for esthetic analysis, whilst also making clear the complexity of esthetic anterior tooth restorations. Both systems are readily applicable in their own right and provide an important aid for esthetic rehabilitation.

Despite this, one is still left with the practical question of how one gets from the identification of specific esthetic problems to a comprehensive synoptic treatment plan. That is, complex esthetic problems can rarely be resolved with restorative measures alone; rather, they require a combination of orthodontic interventions, surgical pretreatment, color correction, and conservative and prosthetic measures. The checklist allows us to work through relevant questions systematically to arrive at particular treatment measures. The identified esthetic defects of a smile directly determine these treatment measures. Ensuring that the latter are correctly timed is essential for a smooth treatment course. Thus, for example, any soft tissue correction procedures need to be scheduled far enough in advance to allow the tissue sufficient time to heal⁵¹, thus avoiding potential recession of the gingiva around the restoration later on. Similar considerations apply to the bleaching of abutments or neighboring teeth: adequate periods need to he scheduled to allow the final tooth color to establish itself before any restoration can be carried out²⁷.

Often, these measures and recovery periods can be coordinated very effectively with the necessary implant surgery: (1) It is possible to combine certain procedures, thus reducing the total number of procedures for the patient. For example, an apically repositioned flap (ARF) procedure required for a neighboring tooth can be combined directly with the implant surgery. Similarly, the second stage surgery, which is a purely mucogingival procedure, can be combined with the thickening of the pontic area with a connective tissue graft harvested from the palate. (2) Procedures that require a very long recovery period (eg, the coverage of gingival recessions) should be planned so that the healing period falls within the implant integration time. The same applies to orthodontic measures, which should be coordinated to include the implant healing phases or

dual-phase augmentation procedures (eg, sinus elevation and implant surgery in two sessions) so as to limit the overall treatment duration.

3.2 Esthetics checklist

The esthetics checklist (Fig 3-1) is divided into three differently shaded parts and represents a development of the "short esthetic analysis" contained in Strub et al³⁶⁰ (pp. 393–398). The parts are further divided into 12 categories. Each category is assigned up to four fields, which need to be verified in the correct order. If one of the fields provides an indication of a problem that requires treatment, this needs to be noted and taken into account in the treatment plan.

The first (light-gray) part contains four categories and is completed together with the patient to provide an assessment of his or her subjective esthetic perception. The second part (medium-gray) contains five categories that are completed by the dentist to record all the case-specific esthetic aspects that need to be considered in the subsequent treatment planning. The third part (dark-gray) contains three categories that deal with important aspects involved in planning the implant-supported prosthesis. These are of particular importance when placing implants in the esthetic zone of the mouth, and are especially helpful in assessing case complexity and for clinical case planning. The first and second parts were published by Wolfart⁴⁰⁹ in 2011 and form the basis for the third part, which was developed later.

The checklist provides an overview of the individual categories. Sections 3.2.1 to 3.2.7 below closely follow the cited article by Wolfart⁴⁰⁹.

3.2.1 Categories one to three: the patient's subjective esthetic perception

The esthetics checklist starts with the question of how the patient would currently rate his or her own smile. This subjective evaluation is rated on a scale from "completely dissatisfied" to "very satisfied." Subjective problem factors are noted so that they can be taken into consideration in both the provisional and definitive restorations. This is followed by a question about earlier portrait photos of the patient. If such photos are available, a discussion with the patient should follow to determine his or her level of satisfaction or dissatisfaction with the original dentition and smile at the time the photos were taken. This information is recorded and contributes directly to the planning process for the future restorations.

At a later point, the patient is questioned about his or her satisfaction with the integrated provisional restoration using the same checklist. The final prosthetic phase should not be initiated until the patient is satisfied with the provisional from both a functional and an esthetic point of view. After all, if patient satisfaction has not been attained, both the dentist and the dental technician will not have a clear objective in mind when designing the restorations, and a satisfactory outcome cannot be predicted. In such a situation, the recommended procedure is to continue correcting the provisional until the patient is satisfied and the dental team has clear specifications for the subsequent restoration.

3.2.2 Category four: character of the smile

Analysis of the present and previous situation is followed by a question regarding the desired character of the future smile. The patient should make an intuitive choice from the categories "lively," "discreet," "blend," and "perfect." This classification has been taken from Chiche and Aoshima⁷⁷, its intention being to give the dentist and dental technician a more in-depth feel of the patient's ideas and wishes.

3.2.3 Category five: smile analysis

This category is subdivided into the following points: dominance and proportions, tooth-to-tooth proportions, tooth lengths, and visibility of the teeth. Since the central maxillary incisors affect the smile more than any of the other teeth^{135,326}, the esthetic analysis should always start with them. Figure 3-2 summarizes the aspects of the smile that should be assessed in this category.

1	Satisfaction				What bothers you?
	(today)?	Completely dissatisfied Very satisfied			-
2	Satisfaction with smile				What bothers you?
	(previously, photo)?	Completely dissatisfied Very satisfied			-
3	Satisfaction	•			What bothers you?
	with provision- al restoration?	I restoration? Completely dissatisfied Very satisfied		-	
4	Desired character of smile	Lively	Discreet	Blend	Perfect
5	Smile analysis	Dominance of central maxillary incisors/ proportions	Tooth-to-tooth proportions	Pleasing tooth length	Visibility of teeth
6	Level of the maxillary teeth	Vertical (bite height)	Horizontal (incisal edges)	Negative space	Sagittal
7	Abutment tooth	Color	Extrusion	Apically repositioned flap (ARF)	Soft tissue correction
8	Pontic	Shaping of pontic bed	Surgical correction (vertical)	Surgical correction (horizontal)	
9	Neighboring teeth	Color	Shape	Position	Soft tissue correction
	Implant-supported prostheses				
10	Smile line	Ginigival effect Important: (1) Exact implant position (2) Optimized soft tissue and bone reconstruction (3) No visible junctions between pink acrylic/ ceramic and gingiva	Cervical effect Important: (1) Exact implant position (2) Optimized soft tissue and bone reconstruction (3) No visible junctions between pink acrylic/ ceramic and gingiva	Incisal effect Compromises possible: (1) Implant position (2) Soft tissue and bone reconstruction (agree with patient!)	
11	Vertical tissue loss	High Bridging the defect: Surgically Prosthetically Fixed (pink ceramic, technically demanding) Removable (pink acrylic, compromises of im- plant position possible)	Low Bridging the defect: Surgically Prosthetically Fixed (pink ceramic) Fixed (long dental necks) Removable (pink acrylic)	None Exact three-dimensional implant position very important!	
12	Types of provisional restoration needed	1st provisional Fixed Resin-bonded tooth Cantilever resin-bonded FDP FDPs	1st provisional Removable Splint Interim prosthesis	2nd provisional Laboratory fabricated Schedule in impres- sion-taking during surgery!	2nd provisional Chairside Vacuum-formed template Consider provisional abut- ments!

Fig 3-1 The checklist is divided into 12 categories, illustrating important esthetic, prosthetic, and implantological aspects. The four categories in part one (light-gray) are completed together with the patient and provide an assessment of the patient's subjective esthetic perception, namely his or her experiences and expectations. Part two (medium-gray) is completed by the dentist. All the case-specific aspects of the five categories are recorded and later taken into account in the treatment planning. The three categories shown in part three (dark-gray) provide important indications for the planning of the implant-supported prostheses. Above all, they are helpful in assessing case complexity and for clinical case planning (modified from Wolfart⁴⁰⁹).