SERGIO BORTOLINI ALFREDO NATALI MAURIZIO FRANCHI

OT Equator Biologic Abutment A new concept of fixed and removable implant prosthodontics



DEMIR EDITORE

Preface

Potest ex casa vir magnus exire Seneca, Epist.,66,2.

(From a humble hovel can a great man rise)



Preface

During the course of our academic career, we have always asked ourselves what could be the most engaging way to transmit the drama of edentulism and our great-grandfather's dentures to 20-year-old odontology students that are well-off, have perfect figures and bright teeth and live in an age of medical miracles.

It is more or less like explaining the daily life difficulties that an octopus has to a white shark.

On the other hand, we have always thought that one of the amplifying factors of the percentage of clinical failures for removable dental prostheses is the fact that the specialist in charge of the procedure is a dentist that does not fully understand the daily drama and monumental stress that a patient needs to face while wearing an incongruous removable prosthesis so as to conduct a normal day-to-day life.

The discouraged or depressed face of a person that wears dentures changes when hope resurfaces of a fixed reconstructive treatment.

This text is comprised of 10 sections that represent the typical path in dental patient management and presents a guide to the reader of differential diagnoses that help in the comprehension of the how, when and why of the proposed clinical solutions. Our objective is not the systematic dissertation in the form of an encyclopedia of problematic implantology, but the presentation gallery of collected clinical cases in every chapter so as to present some innovative ideas in the form of an album. We would also like to point out to the reader that we have initially only summarized the diagnostic phase and the prosthetic implant treatment plan in this text and that there will be a consecutive eBook.

The main points within this work are represented by the presentation of various procedure projects and innovative products that have been developed in our PhD course "Enzo Ferrari" in Industrial and Environmental Engineering and in the "MilleChili Lab" at the University of Modena and Reggio Emilia. Among the various products are the universal abutments (Equator Profile - Rhein 83, Bologna, Italy), the materials for the intraoperative sterile and radiopaque dental impressions (Elite Implant, Zhermack spa, Badia Polesine (RO), Italy) and the Duravit Evolution dental implants (BeB Dental Implant Company, Pieve di Cento (Bologna), Italy).

Prosthetic dentistry is not simply an art, but is a biological science. Products and procedures will be presented in a clinical context.

Therefore, the objectives of the proposed techniques can be summed up in the following words:

- Overcoming the differences between fixed and removable prostheses within the choice of implant component parts.

- Simplification of the dental and dental technician operative phases and above all of the outpatient work time.

- Patient satisfaction.

The prosthetic implant rehabilitation will be definitively presented through a process guided by the intellect of responsible biomedical technicians and not by computers, advertisements or the industry. The result needs to be the enhancement of the patients' real lives and the complete satisfaction of their wishes.

Our aim is to better the life and spirit of the "octopus" by taking those of the "shark" as an arrival point and inspiring goal.

The fact that at the Olympic Games, an admirable athlete with prosthetic limbs ran an Olympic competition and is held to be one of the best able-bodied athletes in the world, makes us think that we can really do it. Sergio, Alfredo and Maurizio

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Dedication

This book is dedicated to our patients and their respect, appreciation and trust that have made us who we are and have taught us to esteem the concrete and enduring results in the continuous battle between necessary and desired odontology.

Acknowledgements

The authors wish to express their thanks in particular to Ezio Nardi, Founder of Rhein 83 and General Director of OT Dental Studio, to the Engineer Paolo Ambrosini, General Director of Zhermack s.p.a. and to Dr. Claudio Banzi, General Director of BeB Dental Company, that have enabled our research project and with generosity made it possible to complete this textbook.

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ISBN n. 9788890773716 Version 2.0 May 2014 edition DeMIR Editore - Via Eridania, 179/A, 45030, S. Maria Maddalena (RO), Italy

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Professor Sergio Bortolini became Associate Professor at the University of Modena and Reggio Emilia where he won the Professore Associato di Malattie Odontostomatologiche (MED28) Competition in 2004. He has been teacher of Prosthodontics from 2001 to 2011 and of Gnathology and treatment of the cranio-cervical-mandibular disorders from 2006 to 2009. He is currently lecturer in Dental Materials and Technology both at the Dental School and at the "Enzo Ferrari" PhD course in Industrial and Environmental Engineering at the University of Modena and Reggio Emilia.

Since 2004 he has been lecturer of Removable Partial Prosthesis at the II level Master in "Oral Rehabilitation" at the Dental School – "Alma Mater Studiorum" – University of Bologna.

Dr. Sergio Bortolini received his Odontology Technician diploma in 1987 and in 1992 graduated with honors with a degree in Odontology and Dental Prosthesis (DDS) from the University of Verona.

Dr. Bortolini was Instructor of Dental Prostheses in addition to leading research groups at the University of Ferrara from 1993 to 1997 and at the University of Bologna from 1998 to 2001, researching the rehabilitation of partial and total edentulism and applications of titanium in oral surgery and restorative dentistry. At the University of Zurich, he attended courses in "Diagnosis and Treatment of the stomatognathic system" in 1995, which was headed by Professor Sandro Palla.

From 1998 to 2001, at the Department of Prosthodontics at the Dental Clinic of the University of Bologna, directed by Professor Roberto Scotti, Dr. Bortolini continued clinical and educational activities in the field of oral rehabilitation, diagnosis and treatment of gnathological disorders, research targeted towards polymeric materials, the use of surgical impression materials and biocompatible prosthetic dental materials.

In 2001 he began his career at the University of Modena and Reggio Emilia, where he teaches at the Dental Clinic of the

Policlinico of Modena, headed by Professor Ugo Consolo, with particular reference to complications of edentulism, the atrophy of the jaw and gnathological therapies and conventional and implant prosthesis. During these years, he continues the research activities in the field of biocompatibility of dental materials, develops some original research projects on materials with high technological content for metallic and ceramic framework and designs innovative components for implant prosthetics.

Since 2012 he has focused on international research projects related to biomaterials, dental technologies and physiology of the human masticatory system. He is the author of 270 publications in national and international journals and textbooks:

"IL TITANIO IN PROTESI PARZIALE RIMOVIBILE" Masson 2000,

"PROTESI COMBINATA AD ANCORAGGIO FRESATO INDI-VIDUALE" Piccin 2004,

"L'IMPRONTA IMPLANTOPROTESICA" Team Work Media 2008,

"SBIANCAMENTO PROFESSIONALE DEI DENTI VITALI" Team Work Media 2010.

Dr. Bortolini specializes in prosthetic and functional rehabilitation of complex patient cases. His clinic, the S. Maria Maddalena Dental Clinic is located in Occhiobello (RO), Italy.

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Dr. Alfredo Natali graduated with a degree in Odontology and Dental Prosthesis (DDS) from the University of Modena and Reggio Emilia in 2001. His thesis was entitled "Titanium removable partial denture anchored to implants" (N.74155). The thesis has presented the possibility of anchoring a removable prosthesis in titanium with a small number of osseointegrated implants placed strategically on the arch. Design variables have been studied in addition to the impact of the oral prosthetic ecosystem correlating to theoretical concepts and combined with the experience of twenty clinical cases over five years. He was a clinical tutor for the faculty of Dental Prostheses from 2001 until 2013 and has been Professor of Dental Materials from 2006 to 2010 at the University of Modena and Reggio Emilia. Since 2009, Dr. Natali has also been Professor of Prosthetic Technologies. From 2010 to 2013 he was Professor of Prosthetics for the Oral Rehabilitation course and was lecturer of the II Basic Course of Specialization in "Prosthesis on Implants: from the impression to the finished product" during the 2008 academic year at the University of Modena and Reggio Emilia.

From January to December 2010 in agreement with the Dental Clinic at the University Hospital Policlinico of Modena he provided outpatient services of Prosthodontics and emergency Odontology.

He is the holder of a research grant from 2010 entitled "Overdentures for immediate loading: preclinical study for the use of reduced diameter osseointegrated implants with original Equator attachments".

Dr. Natali is the author of numerous scientific articles, more than 100 scientific posters, presenter at various congresses in addition to being a presenter at the Prosthetic Implant Specialization Course held at the University of Modena and Reggio Emilia. He specializes in Dental Prostheses, Materials and Technologies within the dental field.

His research has been focused on the application of osseointegrated implants in all kinds of mobile and fixed prosthetic rehabilitation, the study of biomechanics with FEM simulation, new manufacturing technologies for prosthetic framework with CAD CAM methods (rapid prototyping) both in zirconia and metal (DMLS of Cobalt Chrome).

Dr. Natali is a member of the multidisciplinary and international group for the study of new Rapid Prototyping (RP) Technologies applied to the biomedical and odontology fields.

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Professor Maurizio Franchi has degrees in Medicine and Surgery from the University of Ferrara in 1982, and has a specialization in Dentistry from the University of Florence in 1993.

In 1986 he was the winner of a public competition and was hired by the University of Ferrara, taking service at the Section of Dentistry and conducting research. He then held the position for outpatient services for the Arcispedale Company -"St. Anna" University Hospital in Ferrara until 2003.

In 2000, Professor Franchi won the national competition for Associate Professor MED 28 and was nominated Professor at the School of Dentistry at the University of Ferrara. He continues to lecture on Clinical Dentistry and Removable Partial Dentures and since 2012 has also organized the courses for Odontostomatologic Special Pathology.

Since 2004 he has been lecturer of Removable Partial Prosthesis at the II level Master in "Oral Rehabilitation" at the Dental School – "Alma Mater Studiorum" – University of Bologna.

Professor Franchi has been a member of national scientific societies such as SIOCMF, SIPMO, SIO, SIOPI, in addition to carrying out charitable activities aimed at teaching and research at the Section of Dentistry, Department of Biomedical and Surgical Sciences at the University of Ferrara.

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Dr. Franchi is the author of numerous scientific articles, presenter at various national and international congresses and co-author of the following textbooks:

"Il titanio in Protesi Parziale Rimovibile" ed. Masson - 2000,

"Protesi Combinata ad Attacco Fresato Individuale" ed. Piccin - 2003.

Co-authors

The authors want to thank those who, for different reasons and with different qualifications, contributed to this work.

Their participation, enthusiasm, help and support have been appreciated, and the confidence with which these people have cheered us on was essential for the preparation of this textbook.

Thanks to:

DDS

Andrea Berzaghi, Matteo Martinolli, Maurizio Paiardi, Alessandro Lolli, Angelo Banzi, Riccardo Nardi, Panayotis Georgakopoulos, Ioannis Georgakopoulos. Professors and Lecturers of the "Enzo Ferrari" PhD course in Industrial and Environmental Engineering and in the "MilleChili Lab" at the University of Modena and Reggio Emilia

Federica Bondioli, Andrea Baldini, Massimo Messori, Paolo Veronesi, Paolo Tartarini, Andrea Gatto, Giuseppe Antonio Mulas, Enrico Bertocchi.

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The English Edition was possible thanks to the valuable help of Jaime Spataro.

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Introduction

Nullus est liber tam malus, ut non aliqua parte prosit Plinio Epist.,3,5,10.

(There is no book so terrible that somewhere it does not contain something great)



Section 1

Introduction

The affirmation of models and styles of life that are always more receptive to health problems, the increase of the population's average life expectancy, the constant growth of needs tied to the quality of life and to the care of one's appearance in addition to the viability of innovative therapeutic strategies and modern implantology can be sufficient enough motives to consider prosthetic dentistry with adult and geriatric patients as it is a continuously expanding discipline.

The luxury of becoming old is one of the principal additions of the 20th century: the promises of esthetic medicine, genetic engineering and regenerative medicine have opened up unexpected avenues and promised a prosthetic future that is less troubling for the edentulous patient.

Nevertheless, the current elderly population presents an even more elevated presence of partial and total edentulism in many European countries and beyond, as they could not benefit from prevention techniques from the principal inflammatory oral cavity pathologies.

The simplification of the reconstructive treatment plan therefore depends on a triad of components that are:

a) The scientific knowledge of the technician that needs to be able to guarantee the function, aesthetics and duration of the oral reconstruction

b) The manual ability that allows the personalization of techniques and protocols supported by scientific evidence

c) The odontologist's compassion that allows the understanding of patients' wishes, guiding them through the difficult decision process of therapeutic alternatives and giving value to incorporating the prosthetic object by overcoming objective limits.

Present day dentistry needs to start from the firm belief of having the same probability of success and the same goals for an elderly patient that needs a prosthesis as with a young patient.

The clinician needs to know the existing differences between aiding, curing and rehabilitating the patient from edentulism. In addition, he/she needs to know the biomechanical differences between anchored and supported prostheses in implants. Too often in fact, the patient's life worsens due to the ignorance of the clinician.

There are three key points in this section: Aiding, Curing and Healing the edentulism.

1. Aiding Edentulism – Conventional reconstructive prosthetic solutions.

Total and partial removable prostheses are frequently limited to aiding the partial or total edentulism condition by removable devices supported by the mucosa or by both the teeth and mucosa. These solutions require a great capacity of adjustment by the patient so as to overcome the strenuous time period of acceptance of the prosthetic body. Often, the "prosthetic integration" phase can result as being complicated by objective and subjective factors that create difficult barriers for many, even expert, technicians working within the field.

For many years in Italy, it was considered that these basic prostheses represented social odontology, or rather the minimal prosthetic apparatus guaranteed by the public health system to the poorest classes of the population. Nevertheless, literature has unmistakably demonstrated that there is a complex interpretation of clinical cases and many objective and subjective parameters that need to be taken into great consideration. The percentage of operation technique failure is substantial.

The syndrome of "not accepting the prosthesis" continues to reap in victims and many patients prefer to go without teeth rather than to wear a prosthesis that is incongruous, as described by Aron Fenton in IJP. It is with this in mind that this book has been written. It intends to be a modest instrument of diagnosis and cure for the effects of edentulism through simple prosthetic proposals developed at the University of Modena and Reggio Emilia. Our firm belief is that a revolution such as prosthetic implants cannot be considered complete until the benefits that it brings are available for everyone.

2. Curing Edentulism – Removable prostheses with a dental or implant anchor.

The techniques of overdentures cure the condition of edentulism with greater comfort for the patient. Such solutions are widespread and are confirmed based on some clinical needs that emerged after the presentation of the Branemark protocol and are successfully used by many technicians all over the world.

3. Rehabilitation from Edentulism – Fixed Prostheses.

Patients are rehabilitated from edentulism and forget about the mutilation brought about by the loss of teeth. The perseverance of the fixed prosthetic technique moved toward complete implant support and was brought about by the 1982 Toronto Conference. The therapeutic philosophy that brings an edentulous patient towards a fixed prosthesis was immediately widespread while the clinical and odontological operative techniques described as part of the ad modum Branemark are continuously evolving. This book offers a practical and pragmatic contribution to implant prostheses by proposing simplified protocols so as to reduce time and costs of the prosthetic reconstruction. Our objective is the outpatient prosthetic routine without the useless specialized embellishments. The purpose of this book is not to teach the sciences of anatomy, physiology or biology of the juxtaposed implant interfaces or to offer a systematic literature dissertation that underlies the clinical and technical choices that will be presented to the reader. We hold it to be true that clinicians and technicians that are involved in such complex matters should already be instructed in these fields.

Those who complete an implant prosthetic treatment plan for an adult or elderly patient need to be familiar with the surgical and prosthetic clinical practice and know how to handle the patient in all therapeutic phases.

The implant prosthesis is a technique, not a discipline, and therefore needs to be a professional skill set of all of the specialized branches of odontology.

Aiding, Curing, Healing?

We would like to propose a series of guidelines aimed at reducing the number of office visits for the management of complex cases and a rational dental practice that is scientifically supported, but enriched with the art of curing from the first edentulous patient visit all the way through to the classic operative procedures of the implant prosthesis and accompanied by a complete recovery of oral functions, making the patient forget both the edentulous mutilation and the intrinsic limits of the removable prosthesis.

The didactic model that has been chosen in this eBook is presented as a series of particular clinical cases that are managed by general dentists and in large part by our ex-students and us, demonstrating how the procedure is easy and affordable for everyone.

The authors' ambition is for an increasingly larger number of individuals to be able to contribute by giving the joy of living back to patients. Thanks to implant prosthetic success, it is possible to obtain a new state of physical well being, both mentally and socially; it is in this last instance that our therapy, even though it is simple and aimed at social dentistry, can give back this joy of living.

All of the innovative devices originating from our project have been clinically tested for at least 5 years.

The development of the prototypes was carried out thanks to the laboratories of the University of Modena and Reggio Emilia, the University of Ferrara and the Center for Research and Development of the Rhein 83. In addition, private dental practices selected by us have collaborated in the clinical trial. Nevertheless, these case series have been created from intuition and clinical common sense and need to be further researched in order to be scientifically classified.

The authors are open to any comment and will make modifications to protocols proposed if there are better practices in terms of effectiveness and clinical efficiency.

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Chapter 2

Psychological Approach to the Patient

Vivere est Cogitare Cicerone, Tuscul.disp.,5,38,111.

(Living is Thinking)



Notes on Clinical Psychology

J. J. Sharry in his 1968 text "Complete Denture Prosthodontics" said: "In order to avoid the degeneration of odontology in a field that is purely mechanical, it is necessary to teach awareness of human behavior and personality."

It is without a doubt that the key to success in odontology is the capacity to establish a doctor-patient relationship of trust. Nevertheless, in our society the doctor-patient relationship is changing and the respect shown to the medical class seems like it is progressively diminishing in comparison to the past.

In addition, the exceeding "non-acceptance of prosthetics" syndrome is dangerously prevalent, where the patient questions the dentist's work and often refuses the prosthesis based on objective or subjective ideas.

The phenomenon is generally contrasted in two ways: accepting the professional clinical figure from the empathetic point of view; instructing the patient to utilize adequate and esthetically pleasing prostheses with an appropriate amount of patience.

In the first few office visits, a great effort must be made to understand the patient and his/her wishes. In the following visits, it is necessary to demonstrate the understanding of his/ her concerns and to pragmatically work on the possible solutions and various problems.

Technically perfect rehabilitations can fail due to human factors or behavioral errors of the dentist and/or of the staff.

And vice-versa, prostheses that are at the edge of discrepancy can be acceptable if the doctor-patient relationship is solid.

Clinicians therefore need to be educated to maintain an elastic code of conduct that can be strong and firm with certain patients, while being gentle and reassuring with others. If personality conflicts cannot be resolved by modifying the approach of either or both parties, it is well advised to not complete the treatment and suggest that the patient is directed elsewhere. If the treatment presents a serious psychological imbalance, the treatment can then become impossible.

The patient needs to perceive that the dentist has the patient's personal and genuine interest in mind of his/her well being. In addition, the dentist needs to show that the edentulism issues are known and understood and that appropriate steps are in place to resolving the objective and subjective variables of the oral reconstruction treatment plan.

It is important to make the patient and our students understand that the goal is to cure the person and not the mouth. In addition, the overall relationship between the patient and dentist needs to be supported by a triad of scientific knowledge, manual ability and kindness.

Odontology as a medical field can only be upheld by professional figures certain that the art of curing is a key point of professional success. The prostodontist needs to also realistically explain to the patient what the impractical expectations are with logical and sincere clarification.

Patients that are well informed exhibit a lower level of anxiety, have more trust in the dentist and better accept the prosthesis.

It should never be forgotten that the best anxiolytic support for the patient is the medical professional.

It should also never be forgotten that the clinician has the opportunity to substantially improve the patient's life, especially in the case of a complete full arch rehabilitation, by helping him/her overcome a disabling mutilation such as edentulism with a therapy that not only has local oral effects, but also systemic effects of rejuvenation, self-esteem recovery and regaining an active and gratifying life that a total removable prosthesis often undermines, fatigues or even destroys.

Psychological Classifications

In a report from M. House in 1937, patients were classified into 4 categories that, according to our judgment, are still current. Even today, when we happen to read the paragraph and see the drawing that describes and eternalizes the various behaviors, we are convinced of the great practical and didactic meaning that this classification has and that is also outlined in other classic removable prostheses texts such as Johnson Stratton.

Cited below is the original House outline information with a few specific modifications aimed at the implant prosthetic patient.

Patient with reflective behavior

This is demonstrated as a calm, sensible, educated, motivated and trusting patient that listens and understands, trusts in the ability of the clinician and is able to be advised and shares with his/her attending doctor the choice of solutions that are more suitable to resolving the clinical issues at hand.

It is this type of patient that says, "Go ahead, it's ok with me."

These patients have a favorable prognosis and can be managed with excellent therapies according to an operative protocol with minimal customization.

They are also able to understand reasonable variations throughout the course of treatment following unforeseen issues in the therapy plan, with the prudent odontologist's attentive suggestions and explanations before discussing sensitive variations in pricing.

Fortunately, the majority of patients belong to this category.

Demanding and critical behavior

Micromanaging patient, methodical, difficult to please, compulsive, sometimes with unstable health issues or with health phobias, requests written warranties.

The patient does not accept variations of the therapy plan and tends to interpret them with distrust or as diagnostic errors.

He/she could have had previous negative experiences with other dentists.

The treatment plans for these patients can only have good prognoses with a skilled and wise work team in respect to meticulous schedules and precise phraseology that is soothing and positive among clinicians and assistants.

It is furthermore necessary to work with order and organization.

The critical patient is sensitive to all details of the treatment plan, even the smallest details of our job is observed, verified and judged with the distrusting magnifying glass, fearful that the plan will be unsuccessful.

Lastly, particular attention is needed for the acceptanceincorporation consignment phase of the prosthesis with references aimed at the last part of the treatment phase and additional feedback courtesy calls so as to make a confirmation of the gradual and slow process of acceptance as well as the verification of the esthetic judgment of family members in reference to the new prosthesis. The patient needs to understand the benefit of noteworthy assistance and a continuing and thought-out therapy plan by the clinicians that not only take the reconstructive therapy to heart, but also the support over the time of the restoration.

At the end of the treatment plan, if the teamwork was successful and went well, this patient will need to become a study resource for the attending odontologist. Once these patients are able to trust their current care provider, possibly after a previously failed prosthetic attempt, they will never again change the clinician that won them back and are willing to drive long distances, so as to continue treatment.

Hysterical behavior

Classified as a terrorized patient with oral conditions that are generally very compromised and neglected and has insufficient oral hygiene; very often blames a previous dentist for the mediocre oral condition.

The patient tends to be emotionally unstable with paranoid behavior.

This is a type of patient at risk, who very often misses appointments or quits treatment altogether with no forewarning.

In this case patience and reassurance is also necessary, however, the treatment plan needs to be created for brief progress stages, possibly with the safeguard of natural teeth and without resorting to presumptuous behavior or unrealistic promises.

Indifferent behavior

Classified as an uninterested patient, often does not complain about the lack of social and/or functional ability even in spite of extended edentulous areas. The patient seems to be neglectful of his/her appearance or of his/her abysmal smile. It is very difficult to educate this type of patient on the use of removable prostheses and often he/she already has one that is near new or has never been used.

According to our dental observations, this type of patient generally seeks assistance due to dental pain or discomfort, is one to summarize the medical history form and tends to leave sections blank regarding neurologic and psychiatric pathologies, illnesses and smoking or drinking habits.

In addition, dietary habits are also insufficient and can be recognized as accurate and typical dietary deficiency syndromes.

The prognosis is often unfavorable until the patient recovers positive inspiration for his/her social life.

Fig.1: Patient with reflective behavior



Fig.2: Demanding and critical behavior





Fig. 4: Indifferent behavior



Chapter 3

Medical History

Nulli sapere casu obtigit Seneca Epist.76,5.

(No one became wise by chance)



SECTION 1

Medical History

Implantology, as with dental surgical procedures, represents an invasive medical act that, even though it is almost exclusively an outpatient procedure and is not a life saving operation, should nonetheless not have useless risks for the patient.

It is essential to collect a complete medical history without leaving any details left out.

Our operating protocol calls for a medical history form to be filled out by the patient. It is comprised of a vital statistics part with contact information, the name of the family doctor and an existing recent and past health conditions section complete with present or past cardiovascular, endocrine, kidney and metabolism medical issues.

A second part is dedicated to oral pathology and to the past and recent dental history. This section also contains some preliminary information on the temporomandibular joint (TMJ) and on the parafunctional habits of the patient. A section is also reserved for the chief complaint and the reason that the patient is asking for our assistance. This criterion is held under large consideration in both the initial interview as well as during the outline of the therapy plan on the second visit.

On this form is a box that is reserved for the odontologist to fill out any necessary and immediate information regarding the dentures with an additional free section reserved for any further dental notes.

The medical history form will be frequently updated and the patient will be asked to update it at least once a year in the case of important variations regarding the patient's general health conditions.

The document concludes with the date and signature of the patient.

Section 2

First Edentulous Patient Visit

Our work protocol begins with a consultation with the adult or elderly patient, a compilation of necessary recent and past medical history and listening to the patient's requests and therapeutic expectations.

Generally, the patient comes into the office after a brief telephonic meeting with an administrative employee and after receiving the plan for the first dental appointment. The secretary welcomes all new patients where they are then asked to fill out a medical and dental history form. Patients then complete an initial visit, together with the compilation of clinical information, medical objective and diagnostic imaging, blood tests for patients with existing medical conditions and a set of diagnostic impression and cast correlation - thanks to the facebow diagnostic procedure. It is custom for the clinician to hold a structured consultation and kindly elaborate on all of the pragmatic points of the patient's medical history and collect a list of problematic issues complete with precise requests (chief complaints) from the patient. Finally, a series of intraand extra-oral photos completes the informational meeting.

All clinical odontologists are educated to collect recent and past dental history and a brief dental chronology of the single patient with the relative subjective impressions pertinent to the perceived quality, the duration of treatment and the personal satisfaction of the patient in respect to the previous dental restoration.

Subsequently, a joint, multi-physician appointment is convened for the dental office where the clinical case is held to reassess all of the clinical, X-ray and technical information and to compile one or two possible treatment plans that are complete with detailed time span and cost analyses of the treatment.

Every clinical case needs to have an odontologist that is responsible for the entire treatment plan and that demonstrates the ability to lead the treatment, even in situations of working with other specialists during the entire therapy process. In almost all cases, the person directly responsible for the treatment plan is the prosthodontist.

On the second visit, the patient receives an outline of the proposed therapies, the advantages and disadvantages of the proposed solutions, the possible side effects as well as the duration and costs of the complete treatment plan. In the case of patient approval of one of the treatment plans, a contract is drawn up and signed and the first treatment appointment is scheduled.

The balance between various fundamental variables such as the age of the patient, the invasiveness and quality of the treatment are directly proportional to the cultural preparation and the sensitivity of the clinician (above all in elderly patients with complex medical histories, their intake of particular medications and previous or ongoing oncology pathologies) in order to make the preparation for every treatment plan absolutely unique for that individual clinical case and unlikely to be applied to other clinical cases that appear to be similar.

Not even the professional experience of ten dentists' lives can guarantee a zero margin of error to clinicians in reconstructive prosthetic treatment.

The impossibility to obtain a 100% success rate is a great frustration for inexperienced clinicians, but in any case needs to be a goal in terms of prudent education for every person in the medical field. Chapter 4

Patient Selection and Philosophy of the Implant Prosthetic Treatment

Crescit Audacia experimento Plinio, Epist.,9,33,6.

(By experimenting is increased boldness.)



Section 1

Patient Selection and Philosophy of the Implant Prosthetic Treatment

Not all consulted patients that request an implant prosthetic treatment plan can be eligible for therapy.

The selection of the patient is influenced by many parameters: local, systemic, metabolic, anatomical, hygienic and also economic issues.

The economic capacity of the patient very often plays a decisive role in the decisions made by the physician and which therapy to choose and to recommend. The clinician needs to therefore carefully consider the biological and economic costs and draw on concrete information in terms of the cost/benefit balance.

Frequently, this is one of the points that is not sufficiently analyzed in dental school. Patients are selected and treated based on different parameters as opposed to private clinics. It is curious to note that the diagnosis and proposed treatment plan (with figures taken equally from patients in both the public and private sectors) in many designated public service facilities (that generally comply with the Livelli Essenziali Minimi) for health care radically differ from those in designated facilities in the private sector.

The fact that the shortened dental arch (SDA) concept struggles to maintain itself and the regularity that useless treatments are regarded as completed frameworks for the substitution of 1 or 2 elements is the confirmation of the aforementioned statement.

The limitation for public health care services have forced SSN (Italian national health service: Servizio Sanitario Nazionale) professionals to only supply conventional removable prostheses with percentages of clinical failure that are incredibly higher than top ranking treatments or the implant anchored treatments. Literature has precisely described this issue and public opinion has assimilated the definition of "social prostheses" as a low cost, second-rate therapy. The few publicly funded centers that offer excellent removable prostheses are not able to reverse this inauspicious tendency of opinion.

We would like this book to contribute to this resolving these issues by demonstrating that it is possible to extend the benefits of implant prostheses to a larger percentage of the population.

Unfortunately, implant prostheses continues to be a therapy for the privileged, mostly due to the fact of elevated costs compared to the conventional prosthetic alternatives. Our treatment philosophy for elderly or geriatric patients (especially when referring to simplified solutions as described in the following pages) calls for the patient to receive detailed and realistic information regarding success rates, complications, risks, maintenance necessities as well as the ordinary and extraordinary maintenance costs of implants and prosthetic devices.

Furthermore, the expectations of the patient need to be realistic and need to be in line with the clinical abilities of the odontologist and with the anatomical conditions of the work project feasibility. It is well advised to clarify the attainable results of the treatment with a clear, realistic and detailed agreement.

Nevertheless, in spite of the complexity of the matter, the evaluation of the functional benefit for a patient with an implant prosthetic solution is quick, complete and transmissible.

The functional advantages of fixed and removable implant solutions with respect to conventional removable prostheses are so evident that these solutions (regardless of the number of implants) are perceived as successful therapies with an elevated success rate in terms of effectiveness and chewing efficiency as well as a drastic improvement in the quality of life. The patient's ability to adequately dialog with others, the benefit of a securely anchored prosthesis in regards to an elderly patient's self-esteem and relationships with others is an incredible new life filled with energy and self-confidence. In addition, work capacity generally increases and the patient demonstrates an immediate physical metamorphosis that transmits selfconfidence, satisfaction and a revitalization of finding pleasure in social activities. These factors quickly eliminate the memories of suffering during surgical treatments.

It is never to be forgotten that patients with a conventional removable prosthesis present intrinsic limits of natural functionality that are not able to be modified and force the edentulous patient to heroically adapt to the functions of an oral prosthesis that is completely different from the natural oral physiology of the dental patient, even when it is constructed with an aesthetically appealing appearance and effective retentive criterion according to case studies. This issue tends to be proportional to the level of jaw atrophy.

The process of resignation and acceptance of a removable prosthesis is mitigated in patients that gradually lose teeth. It is a very traumatic transition for patients that lose many dental elements in a short time, even often in one appointment.

Certainly, the patient's social surroundings also play an important role in relation to the psychological acceptance process of a conventional prosthesis. By belonging to a homogeneous social group where individuals have similar health conditions makes one's social acceptance with a prosthesis less difficult as opposed to being part of a social group with elevated competitiveness that imposes capability, ambition and young imagery. In this case, one can perceive the remedial change of extracting all teeth and wearing a removable prosthesis as a nightmare.

Clinicians should make a greater effort of understanding towards this adjustment that is imposed on the edentulous patient and the embarrassment of presenting oneself in public with an edentulous facial profile that in extreme cases is seen as macabre: "the witch's profile".

On the other hand, an incongruous removable prosthesis will further amplify the functional difficulties of the patient and can considerably interfere with the psychic balance of the patient by altering self-confidence or bringing forward true depression symptoms.

All specialists and experts of dental prosthetics have experienced the dejection of some patients that, regardless of the respect of principles of prosthetic techniques and the rigorous application of protocols, have seen the refusal of the prosthesis and have indicated the failure in subjective factors of difficult clinical predictability.

We are of the mindset that the implant treatment represents a valid ray of hope for all people in the difficult process of overcoming their mutilation.

The cases that follow are aimed at this concrete goal by means of simple techniques with elevated predictability. This work

also intends to be a demonstration of our cultural resistance of legends and fashion within modern odontology.

The consideration that millions of patients have received successful implant-supported prosthetic therapies is the best presentation of our quality services.

Odonto-Stomatologic al Semiotics

Nil sine magno Vita labore dedit mortalibus Orazio, Serm.,1,9,59-60

(Life gives nothing to mortals without great effort)



SECTION 1

Odonto-stomatological Semiotics

Patients that are subject to implant therapy need to have the minimum qualifying requirements in order to sustain the operative phases of the treatment in absence of local and systemic counter indications of the therapy.

It is the responsibility of the clinician to evaluate the condition of intra- and extra-oral soft tissue, the anatomy of the receiving area and the systemic factors able to condition the beginning and the maintenance of the osteo-integration.

General health conditions of the patient

Implant therapy constitutes as an elective treatment and the patient must not be exposed to risky circumstances.

The consultation with the patient, in-depth analysis of pragmatic medical history points, in addition to later blood test diagnosis, consultations with other medical specialists or with the family doctor must be part of the routine procedure in dubious cases.

Furthermore, a beneficial and prudent parameter can be considered by using the ASA (American Society of Anesthesiologists) anesthesia risk classification that divides patients into 3 categories:

ASA1: no systemic illness, patient suitable for surgical therapy;

ASA2: light systemic illness, patient can undergo surgery after consultation with the family doctor and/or with the specialist;

ASA3: moderate or severe systemic illness with anesthesia risk, any elective treatments discouraged.

This approach, even though it does not have any legal advantages, offers effective and intuitive information regarding the risk quantification and classification of complex cases.

The in-depth diagnostic testing that is customary within our work group additionally foresees routine imagery diagnostics (OPG, cranial lateral X-ray, periapical X-rays, intra- and extra-oral photographs as well as youth photographs with a natural smile) and an evaluation of blood tests that is done in the last six months of treatment.

If the patient does not have recent blood tests, we prescribe this minimum operative protocol that can be determined by other specific parameters, subject to the discretion the clinician:
- Complete blood exam

- Erythrocyte sedimentation rate (ESR), Anti-streptolysin O (ASO), C-Reactive Protein (CRP)

- Serum iron, transferrin and ferritin,

- Prothrombin time (PT) and partial thrompboplastin time (PTT)

- Glycosylated hemoglobin

- Parathyroid hormone (PTH)

- Vitamin D

Intra- and extra-oral exam

It is beneficial to follow a standard protocol and note key parameters that are summarized in the following:

- Angle's Skeletal Classification

- Facial profile

Documentation with and without the prosthesis needs to be done and the patient also needs to be photographed standing up, both from the front and from the left/right sides, with and without a smile.

It proves to be beneficial to furthermore observe the patient's smile in 3 degrees of intensity so as to underline the tendency

of the median line and any possible asymmetries on the frontal plane and the parallelism of the occlusal planes with the Camper's plane or the Frankfurt plane in the lateral view images.

The orientation of the incisal plane on the frontal plane and of the occlusal plane with the profile of the patient need to all be linked as well as other parameters such as the curvature of the lower lip and the marginal tendency of the lower section of the nose.

The reader can benefit from the known analysis techniques of the face for the removable prosthesis and also for the implant prostheses.

Mastication muscles and temporomandibular articulations

The palpation of the mastication muscles, the jaw depression muscles, the sternocleidomastoids, the anterior section digastric muscle and the muscles of the cervical tract are useful to intercept the tendency of the TMJ dysfunction.

Knowing the pathophysiological aspects of the masticatory system such as bruxism, grinding and deviations or deflections of the way the mouth opens are of great importance in the decision-making process regarding the VDO (vertical dimension of occlusion) and the choice of prosthetic materials for the occlusal restoration. All clinicians committed to the completion of the implant prosthetic treatment should collect the relative information regarding pain, clicking and functional limitations of the mandibular movements and know the prevalence and the effect of the painful dysfunctional syndromes of the temporomandibular articulation in relation to the age of the patient.

The study of the natural or prosthetic occlusal parameters of the patient before reconstructive treatment is an important factor. The semiotic analysis of the patient during the first visit foresees the evaluation of the following:

- Incisive and canine guide or group guide
- Possible deflective contact

These figures need to be verified during the preparation and the completion of the treatment.

Exam of the residual teeth

The abrasive and erosive surface use areas, the micro fractures, the crown-root residual element relationship and the quality of previous conservative restorations all need to be analyzed. Every indication relative to the tendency of parafunctional behavior can be of assistance in the prevention of shortterm prosthetic complications.

Periodontal exam

All of the periodontal indices need to be evaluated and normalized before any implant prosthetic therapy. The periodontal survey and a careful evaluation of the dental mobility always needs to be considered in relation to the level of home hygienic maintenance and the parafunctional traumatic activity.

In fact, the first evaluation to note in the medical file is qualitative. The thick or thin, flat or scalloped dental plaque biotype can have differential diagnostic factors in the choice of both the surgical technique as well as the prosthetic solution that is best suited for the individual patient.

Even the quantitative level of adherent gums plays a key role in the therapy plan.

It is the firm belief of the writers that a sufficient amount of keratinized tissue is advantageous both on a dental level as well as on an implant level and needs to be preserved when it is still present and restored when it is absent.

The exposure of gum tissue in a smile is also an additional key parameter that can condition the therapeutic plan.

Edentulous alveolar processes

The detailed study of bone height and thickness of edentulous alveolar processes is the fundamental parameter in the study of this case.

The clinician should not trust the visual impressions, but must measure with rigorous technique employing volumetric diagnostic imaging without distortions.

In the upper jaw, imaging diagnostics supplies useful information even with paranasal sinus health conditions and the contingent presence of anatomical defects resulting in traumatic extractions or previous invasive procedures.

The study of edentulous alveolar processes leads the choice of useful sites for the implant positioning in function of the peculiarity of the opposing arch. CHAPTER 6

Immediate Postextraction Implants with Immediate Loading

Nihil recte sine exemplo docetur aut discitur.

Columella De re rust.,11,1,4.

(Nothing good is learnt or taught, without the example.)



Section 1

Immediate Post-extraction Implants with Immediate Loading

The substitution techniques of worn out patient's teeth with immediate post-extraction implants and complete arch rehabilitation with a fixed prosthesis that has immediate loading represents a conquest in reconstructive dentistry.

This operating procedure presents several advantages for the patient: first of all, it is very much appreciated as it avoids resorting to a temporary removable prosthesis and secondly, it allows most of the work to be concentrated into a single office visit, thanks to the invention of computer guided and assisted surgery. This office visit can be followed by a series of postoperative visits that are trivial compared to past techniques.

Indications

In clinical practice, the indications of immediate loading pertain to cases of full arch reconstructive therapy and of partial edentulous issues of elevated esthetic value.

Surgical phase

The possibility to extract a natural tooth and to use the socket with sanctioned techniques so as to position the implant with solid primary stability (as described by various authors) leads to high success rates.

The described osteotomy procedures allow the use of rotating, osteotomes and bone compactors, piezoelectric instrumentation as well as combined operative techniques.

The surgical phases can be conducted with a standard flap surgery or flapless. Furthermore, the clinician can take advantage of surgical methods that are computer guided and assisted.

Nevertheless in all techniques, the careful planning of the case with specific attention to the fundamental exams and the anatomical jaw analysis together with volumetric reconstructive techniques allows for a virtual simulation of the surgery and constitutes as a useful diagnostic assistance for the clinician.

Post-extraction implantology is nevertheless a trustworthy procedure but can also present risks and complications that need to be taken into consideration for every individual case.

Temporary prostheses for immediate loading

The setting and the placement of satisfactory temporary prostheses that are able to guarantee aesthetic appearance and function is the critical point of the entire process. The construction and adjustment phases of the temporary prostheses need to respect the criterion of precision, resistance and convenience, in addition to proper placement. This is always a critical point even with expert technicians.

Although some schools of thought support the belief that it is useless to insert a metallic support system inside of the fixed prosthesis, it is frequent within the clinical practice to use mechanical means of reinforcement for temporary prosthetic structures.

For years, it was thought that the prosthetic splinting structure reduced implant micro-movement for oral prosthetics and favored the osseointegration process.

However, in routine clinical practice, the use of a rigid temporary prosthesis with an internal metal framework seems to reduce the incidence of prosthetic complications in terms of structural instability in the connecting areas of fixed prostheses, in the middle structural areas or in the cantilever segments.

For years, terminology and delivery time have been discussed for temporary prostheses in order to return to the citation of immediate loading. There are varying loading possibilities that are presented: immediate, delayed, anticipated or precocious with placement times that vary by hours, days and weeks.

It is the authors' firm belief that it is necessary to proceed with the prosthetic implant consignment to the patient within 6 hours of finishing the surgical procedure in order to be classified as immediate loading. On the other hand, temporary prostheses should not be removed for a minimum period of 6 weeks so as to achieve sufficient implant stability.

The implantological post-extraction and immediate loading procedures of temporary fixed prostheses, which are generally acrylic and have metallic framework, can be designed according to a wide range of possibilities: as far as the anchoring is concerned, they can be screwed in, cemented or held in place by a precise snap mechanism. In addition, they can be directly anchored to the fixture or to auxiliary abutments.

Clinically, the recourse to multiple abutments that hold the implant platform is useful to the temporary prosthetic anchoring outside of the gums and notably simplifies the operating procedure that allows the surgeon to exclude interferences of soft tissue in the subsequent phases of prosthetic positioning.

Our work group requests specific materials for the immediate intraoperative dental impressions after the implant insertion (Elite Implant, Zhermack spa, Badia Polesine (RO) Italy).

The dental impression is completed with open flaps (during the surgery phase) and the pick-up technique. It allows precise positioning of the laboratory analogues and the completion of an immediate working model with low expansion plaster and with very few added devices. It is ready to be assembled so as to wear until the end of the completion of the temporary immediate prosthesis. Techniques and materials for the intraoperative impressions are published in the text, "Impronta in Implantoprotesi" and were edited in 3 languages in 2008.

In addition, we have recently completed a research project for the realization of Equator Profile universal abutments that have been designed specifically for this operative procedure. These devices present a series of biological and biomechanical advantages that are able to greatly simplify the consecutive work phases (OT Equator System, Rhein 83 srl, Bologna, Italy).

The universal abutments allow the clinician to realize a fixed or removable prosthesis with any type of implant therapy, without ever unscrewing any component.

In fact, the spherical abutment is screwed into the implant during the first surgery and does not need to be removed during the consecutive therapeutic phases. The temporary and definitive prostheses present the same anchoring system with two distinct means of retention: a connecting bypass screw and an undercut ring called "Seeger spring". The Seeger provides a secure and functioning elastic retention system that is effective against the possibility of the prosthesis unscrewing. This work philosophy makes the use of temporary abutments decline, impedes apical movement of the connective junction to the abutment level and allows the clinician a wide range of retentive possibilities in every clinical condition, including serious implant inclinations. The clinical cases section will contribute to defining indications, objectives and principals of the operative philosophy. SECTION 2

Case Presentation 1

IMMEDIATE LOADING

CASE PRESENTATION 1





CP1 - Fig. 1-3: 70-year old patient, with exhausted mandibular fixed prosthesis on both teeth and implants and Maxillary Removable Partial Denture (RPD). Chief concern: lower fixed full arch implant prosthesis without having the provisional removable phase.



CP1 - Fig. 4: Pre-op occlusal image. Old mandibular chrome cobalt-PMMA bridge; this restoration, made many years before, had mobility in the second degree and was subject to frequent detachment.



CP1 - Fig. 5: Pre-op image of the residual teeth; distally there are two asymptomatic implants that are still partially integrated.



CP1 - Fig. 6: The extreme periodontal impairment makes the stages of cleaning up the mandibular arch extremely easy.



CP1 - Fig. 7: Extraction of residual teeth with local anesthesia; we kept the two old distal implants for the provisional phase with immediate loading.



CP1 - Fig. 8: Old bridge and extracted teeth.



CP1 - Fig. 9: Intra-op image of the mandibular bone and the signs of the mental foramen from where the alveolar nerve emerges.





CP1 - Fig. 11: Osteotomy and parallelism control with titanium pin.



CP1 - Fig. 12: Intra-op image of the insertion of the first implant.



CP1 - Fig. 13: Intra-op image of the six implants; this project has immediate loading of the four interforaminal implants and the delayed loading of the two retroforaminal implants. The remaining distal implants would allow for a provisional long dental arch with immediate loading.



CP1 - Fig. 14: Intra-op positioning of the OT Equator Biologic Abutment. This abutment will NEVER be removed.



CP1 - Fig. 15: Positioning of the second Equator Abutment and evidence of the parallelism.



CP1 - Fig. 17: Intra-op, mono-phase single material impression with sterile and radio-opaque PVS Elite Implant medium (pick up technique on individual self-curing acrylic tray).



CP1 - Fig. 16: Positioning of all Equator Biologic Abutments.



CP1 - Fig. 18: Detail of the connection of the laboratory analogue Equator before the master model casting.



CP1 - Fig. 19: Mandibular master model in Elite Arti stone. Placed next to the stone model for educational purposes from left to right: the impression pick-up coping, a castable Equator prosthetic cylinder, two long and short prosthetic screws and two Seeger springs.





CP1 - Fig. 22: Intraoral placement of the 4 titanium abutments on interforaminal implants for immediate loading and the protection of the operative field with a rubber dam, so as to prevent contact of the monomer of the PMMA with tissues during direct provisional relining.



CP1 - Fig. 23: Mandibular reinforced provisional prosthesis obtained with the direct finished and polished technique. The distal anchor is secured by the abutments of the two surviving older implants, while the two short implants will be loaded after the healing phase.



CP1 - Fig. 24: End of the first surgical phase, with provisional prosthesis for immediate loading.



CP1 - Fig. 25: Reinforced provisional prosthesis after 6 weeks of oral function.



CP1 - Fig. 26: Gingival healing after 6 weeks from the first surgery.



CP1 - Fig. 27: Master model from the intra-op impression.



CP1 - Fig. 28: Panoramic image of the castable transparent abutments screwed on the analogs of the implants. The procedure presented will lead to the creation of a cobalt chromium framework by lost wax casting.



CP1 - Fig. 29: Prosthetic framework modeling madeby assembling prefabricated castable components. The abutments of the distal implants are also retained for educational purposes. Their next elimination at the discretion of the clinician, will not in any way affect the prosthetic function.



CP1 - Fig. 30: Occlusal view of the completed prosthetic castable frame. This technique is only one of the possible solutions for obtaining a framework for a full arch Equator Bridge prostheses. The Equator philosophy does not impede the use of the CAD-CAM milled solutions or techniques of laser sintering or panthografic milling. The choice of manufacturing technology of the framework is at the discretion of the operator.



CP1 - Fig. 31: Casted cobalt chrome framework on the master model. Thanks to the long screws some considerations are possible regarding the degree of implant parallelism for this specific clinical case.



CP1 - Fig. 32: Framework detail: the anterior segment in lingual view.



CP1 - Fig. 33: Detail of the insertion of the white Seeger spring into the framework.



CP1 - Fig. 34: Detail of the prosthetic connection screw.



CP1 - Fig. 35: The composite veneering of the full arch was made by dental technician Marco Vannini, Rhein 83 laboratory in Bologna.



CP1 - Fig. 36: Delivery of the prosthesis, concluded case.



CP1 - Fig. 38: X-ray of the left mandibular area and the detail of the prosthetic implant connections and compliance with the anatomical determinants.



CP1 - Fig. 37: OPG image at the time of delivery of the mandibular prosthesis. In this clinical case, all abutments are equipped with snap ring and screw. The adaptation of the framework is correct. On the two short implants the solution platform switching was chosen, while the two distal surviving implants were maintained. Although it is unnecessary from a biomechanical point of view, their possible future removal will not affect the prosthetic structure. SECTION 3

Case Presentation 2

IMMEDIATE LOADING

CASE PRESENTATION 2





CP2 - Fig. 1: 58-year old patient, ASA1, artisan, non-smoker. Favorable attitude. He lost the lower teeth for periodontal disease at age 35 and has had two implant therapies: the first attempt failed and a fragment of the osseointegrated implant remained in the area of tooth 34 and the second, immediate loading procedure, with a generous number of implants was successful, has been in function for about 10 years and is a rehabilitation with PMMA teeth and a titanium Procera Bridge. Chief concern: fixed maxillary prosthesis with the least number of oral surgeries possible. Patient is very satisfied with the aesthetic and functional results of the lower denture, also requires a similar solution to the maxilla.



CP2 - Fig. 3: Pre-op OPG. Teeth of the upper jaw appear exhausted due to severe periodontitis. The lower jaw does not have any cantilever. The patient has no symptoms of cranio-mandibulardisorder.



CP2 - Fig. 2: Intraoral clinical situation at the time of the first visit. The upper jaw is treated with metal ceramic fixed prosthesis with two cantilever elements on the right. The teeth are exhausted and the prosthesis has had a high mobility level for several months.

Inferiorly, the implant supported rehabilitation is anchored to the head of the fixtures without any intermediate abutment with PIB technique. It appears intact and functioning, but the assembly of the teeth was conducted under conditions of compromise with the maxillary incongruous prosthesis. This parameter must be corrected and the optimal disposition of the teeth needs to be restored.



CP2 - Fig. 4: Pre-op image of the old fixed metal ceramic rehabilitation.



CP2 - Fig. 5: Lower arch before treatment: a Procera Implant Bridge with Acrylic Teeth. A full replacement of teeth is foreseen when the new maxillary denture is done.



CP2 - Fig. 9-10: The smile of the patient with the old prosthesis shows the limits of the previous bridge. The most relevant clinical data is the long upper lip, with a limited display of the frontal teeth; this incredibly simplifies the dentist's work. The esthetic limits of the old prosthesis are evident.



CP2 - Fig. 6-8: Patient lateral profile not smiling and smiling. This patient displays only one third of the anatomical crown of the frontal teeth. This condition is favorable for an Equator Bridge solution.





CP2 - Fig. 11-13: Complete teeth extraction of the upper jaw and immediate post-extraction implantology. On the left is the old bridge with the residual teeth.





CP2 - Fig. 14-15: Detail of the mono-phase and mono-component with Elite Implant Medium material and splinted transfer with composite self-curing Acrytemp resin (Zhermack spa, Badia Polesine (RO) - Italy). The intraoperative impression has great clinical significance in cases of immediate loading and makes it possible to create a master model of excellent precision and collect all the clinical information for the construction of provisional or final restoration.



CP2 - Fig. 17: Acrylic provisional prosthesis obtained from diagnostic wax-up of the old prosthesis of the patient. This prosthesis has a double function: a) it allows the intraoperative transfer of the jaw relationship at maximum intercuspidation at the end of the surgical stage and, b) to be transformed into the first surgical provisional by relining it in PMMA.



CP2 - Fig. 16: In this specific case, we opted for an atypical temporary prosthesis with a double mechanism of retention: 4 conical abutments for cemented fixed prostheses and 4 nylon caps of Equator Biologic Abuments. This connection mode is a peculiarity of the Equator abutment. This clinical procedure is presented for educational purposes to demonstrate the versatility of the product in the fabrication of fixed and removable provisional prosthesis at the discretion of the clinician without having to replace any components.



CP2 - Fig. 18: Image of the first provisional acrylic prosthesis after 6 weeks of function. The clinician may decide to use it both as a removable or a fixed provisional prosthesis, being sufficient enough to cement the abutments in positions 13, 14, 23, 24.



CP2 - Fig. 19: Image after 2 months; conical abutments in positions 13, 14, 23, 24 have been substituted with Equator Abutments.



CP2 - Fig. 21: The round titanium bar is modeled so as to touch most of the cylinders; this bar is provisionally linked to cylinders in position 13 and 23 and is ready for intraoral welding.



CP2 - Fig. 20: For didactic purpose, this same clinical case is presented with this additional therapeutic option: fixed implant prosthesis with intraoral welding of the framework on dedicated titanium cylinders. Occlusal view of the intraoral welding abutments screwed on Equator Biologic Abutments. Titanium cylinders of increased thickness are specific to this procedure.



CP2 - Fig. 22: Intraoral welding done. This procedure is fast and easy and allows for splinting the cylinders with efficiency and low cost.



CP2 - Fig. 23: Second provisional finished. The welded framework has been incorporated into the acrylic resin, resulting in a provisional prosthesis with a high level of stiffness. This technique was created to splint implants during the first surgery and has been described here only as an example. The use of the Equator Abutments allows a further strategy of retention thanks to the Seeger spring that, in the anterior region can avoid discomfort for the patient due to the visible hole on the vestibular surfaces.



CP2 - Fig. 24: Complete healing of the soft tissues; note that the trasmucosal abutments have never been removed from the oral cavity during operative procedures.



CP2 - Fig. 25: It is evident that a certain degree of implant disparallelism with this work philosophy will be transformed into a retentive advantage thanks to the action of the Seeger spring.



CP2 - Fig. 26: Laboratory phases: installation of maxillary and mandibular replacement teeth in articulator.



CP2 - Fig. 27: The white rings shown are the Seeger springs in the prosthetic abutments.



CP2 - Fig. 28: Completed prosthesis in the mouth.



CP2 - Fig. 29-30: The maxillary arch is made stiff thanks to a casted cobalt chromium framework, while in the lower jaw the previous machined titanium PIB was used again.



CP2 - Fig. 31: Smile of the patient at the end of the treatment.

SECTION 4

Case Presentation 3





CASE PRESENTATION 3

CP3 - Fig. 1: 70-year old patient, with compensated diabetes, previous paralysis of the left VII cranial nerve. He has an exhausted combined fixed-removable prosthesis on telescopic abutments. This patient has no articular pain even if he has bruxism. Chief concern: new implant supported prosthesis on both upper and lower jaws.



CP3 - Fig. 2-3: This patient has Removable Partial Dentures (RPDs) on both jaws, anchored to few natural teeth.



CP3 - Fig. 4: Pre-op OPG: the new rehabilitation plan requires the extraction of these exhausted teeth and immediate post extractive implants with immediate loading on both jaws.





CP3 - Fig. 7: Image after the insertion of the implants: there are two different kinds of implants due to an experimental protocol.



CP3 - Fig. 8: This experimental protocol required the split-mouth comparison between a multi-functional abutment (on external hexagon implants) and an Equator Abutment.



CP3 - Fig. 9: This image details the platform switching technique with the Equator Abutment and a standard emerging profile of the multifunctional abutment.



CP3 - Fig. 10: Preparation for the impression with the pick-up technique, gap between implants and postextractive socket filled with bovine collagen.



CP3 - Fig. 11: Intraoral test for the mandibular tray, adapted from a standard plastic one.



CP3 - Fig. 12: Detail of the intra-op impression: the first layer of PVS (Elite Implant medium - Zhermack spa, Badia Polesine (RO) -Italy) is positioned directly in contact with the bone.



CP3 - Fig. 13: Mono-material, mono-phase impression.



CP3 - Fig. 14: Multi-functional abutment and Equator Abutment, after suturing.



CP3 - Fig. 15: Image of the soft tissues after six weeks from the surgery and immediate loading with temporary prosthesis. Equator Abutments have a smaller diameter compared to other abutments, and the healing of the soft tissue shows a higher volume of adherent gingiva.



CP3 - Fig. 16: Image of the lower jaw after healing.



CP3 - Fig. 17: Image of the upper jaw after healing.



CP3 - Fig. 18: CrCo-PMMA Equator Bridge Prosthesis of the lower jaw with commercial teeth.



CP3 - Fig. 19: CrCo-PMMA Equator Bridge Prosthesis of the lower jaw. Prosthetic cylinders are glued to the fused CrCo framework.



CP3 - Fig. 20: CrCo-PMMA Equator Bridge Prosthesis of the upper jaw. In spite of the eight implants, only three prosthetic screws are used.



CP3 - Fig. 21: CrCo-PMMA Equator Bridge Prosthesis of the upper jaw. Prosthetic cylinders are glued to the framework.



CP3 - Fig. 22: CrCo-PMMA Equator Bridge Prosthesis of the upper jaw. Detail of the anterior flange.



CP3 - Fig. 23: Prosthetic cylinders glued to the framework with two white Seeger springs.



CP3 - Fig. 24: Equator Bridge Prosthesis on the master cast.



CP3 - Fig. 25: Equator Bridge Prosthesis on the master cast.



CP3 - Fig. 26: Equator Bridge Prosthesis on the master cast.





CP3 - Fig. 28: Upper jaw Equator Bridge Prosthesis.





CP3 - Fig. 30: Smile of the patient at the end of the rehabilitation.



Chapter 7

Delayed Loaded Implants

Magno ubique pretiovirtus aestimatur Valerio Massimo 5,4,1.

(In every place virtue is held in high honor)



Delayed Loaded Implants

Indications

Delayed loading implants largely represent a subject matter that has been addressed in literature in the last decade. The indications and counter-indications of the therapy are described in all texts of implantology and are included in the university programs in all dentistry schools around the world, together with classic criterion of bone quantity and quality evaluation. For this reason, we will not debate these subjects.

Implant therapy has few very important peculiarities that are matter of factly obtained, but have revolutionized the clinical history of many patients and given enormous satisfaction to many dentists: it is not a therapy that is influenced by the age of the patient or by chronic pathologies such as musculoskeletal disorders (MSDs), stabilized diabetes or cardiovascular illnesses. Above all, implants do not require medical therapies that are pharmacologically supported, with the exception of very rare cases.

However, often the clinician finds it prudent to go back to the fixture healing techniques as recommended by the original Branemark protocol. This is the case especially in the presence of local factors that are potentially able to reduce the primary stability of the implants or during GBR or GTR procedures.

Intraoperative splinting techniques of fixtures such as intraoral welding seem to be able to offer new contributions to this subject and will probably contribute to further reducing the indications of former techniques in the future.

Currently, the upper and lower jaw arches are treated with few procedural differences. Ultimately, the motivations that bring the clinician to be prudent and call for a waiting period after the implant operation (in the absence of functional burdens) are relative to inadequate bone quality, specifically with insufficient principal stability of the fixture, the necessity to return to GBR methods, the absence of esthetic or functional necessity in partial edentulism or the specific preferences of the surgeon.

In our clinical practice, the criterion of differential diagnosis scrutinizes the bone quality in terms of primary stability of the fixture.

We know that this is a practical subjective criterion of the clinician, however, in the majority of cases it offers solid clinical results.

Nevertheless, with the support of literature data, we have developed a clear preference for immediate loading implants. We reserve delayed loading to cases with short maxillary and mandibular implants (with heights inferior to 8 mm), cases with upper and rear jaw areas and cases with implant positioning in conjunction with lifting techniques of the maxillary sinus and implants inserted at the level of the maxillary tuberosity or at the level of the palatine or pterygoid bone.

In these cases, the temporary prosthetic phase requires particular attention to patient cases that have complete removable prostheses and frequently require treatment of the prosthetic base with resilient materials made from silicon or softened Poly (methyl methacrylate) - PMMA.

The usage period of soft relining materials underneath the removable prostheses varies from a minimum of 6 weeks to a maximum of 3 months. It requires extra maintenance that delays the operative protocol and is normally associated with patient inconvenience for the greater incidence of cracks and fractures of the prosthetic body or for the relining detachment from the borders of the prosthetic base.

Naturally, the procedure of soft tissue adaptation by means of relining materials needs to be repeated even after the second surgical procedure and upon completion of the healing process of peri-implant soft tissues. For this reason, especially for patients without muscular skeletal diseases or temporomandibular joint disorder (TMJD), and in the majority of cases, we prefer to appeal to the immediate loading procedure for front teeth and delayed loading for posterior teeth. For this purpose, the temporary prosthesis is made according to the criterion of the shortened dental arch (SDA). This astuteness is generally appreciated by the patient and is associated with a post-operative phase that is free of extraordinary prosthetic maintenance, sores or fractures. The reduction of masticatory efficiency in the 6 weeks following surgery is compensated by a favorable psychological approach of the patient that begins to benefit from a fixed prosthetic implant on the very first day.

As far as the prosthetic procedures are concerned, the protocol does not change and follows the same objectives that are described in the previous chapter.

Prosthetic Retreatment

The clinical problems of prosthetic retreatment represent an important chapter within the whole field of implantology. It is centered on several peculiarities that the clinician needs to consider in order for the therapy program to be efficient and long lasting.

In clinical practice, prosthetic implant retreatment is distinguished by premature failure, that is rare but very difficult to treat, and the retreatment of delayed failure, that is generally
simpler to manage. The causes of failures can be technical, or rather tied to structural yielding of the prosthesis or its abutments or biological issues, often associated with cavities, paradontal illness or peri-implantitis.

Nonetheless, it is our firm belief that this capacity to emerge from the protocol is part of the art of curing and can obtain success in rehabilitation and patient satisfaction. It is our unparalleled concrete proof of the integrity of our project.

The complex equilibrium of clinical factors, reduced economic capabilities and patient constraints have led us to designing a transitional prosthesis that can be defined as "long-term temporary" prosthesis that partially rehabilitates the maxillary arch and completely rehabilitates the mandibular arch. The series of finalized pre-treatments in regards to the recovery of some residual roots represents a compromise that aims to satisfy the patient without limiting future prosthetic modifications in the case of failure.

With this unique clinical condition, the expert clinician can have significant comfort advantages with the use of EP universal abutments.

SECTION 2

Case Presentation 1



CASE PRESENTATION 1





CP1 - Fig. 1: 64-year old patient with Combination (Kelly's) syndrome; no systemic disease; removable partial denture wearer. Requires only maxillary implant-supported prosthesis. Average economic capacity.



CP1 - Fig. 2-3: Maxillary and mandibular partial edentulism with severe dental and periodontal disease. No occlusal contact of the remaining teeth. Presence of two ossecointegrated implants with two ball attachments.



CP1 - Fig. 4: This image focuses on the poor periodontal support of residual teeth. However, the priority is the patient's need of a functional prosthesis for the maxillary arch.



CP1 - Fig. 5: Pre-operative intraoral view of the maxilla.



CP1 - Fig. 6: Maxillary removable partial denture. The last molar 2.7, though unstable, is the last element of prosthetic retention. Therapeutic alternatives: complete dentures and removable implant prosthesis.



CP1 - Fig. 7-8-9: Mandibular clinical images with and without implants (top). Extraoral, mandibular denture (bottom).



CP1 - Fig. 10: Detail of the mandibular removable denture implant retention.





CP1 - Fig. 12: Equator transfer coping for pick-up impression.



CP1 - Fig. 13: Individual tray for monophase and monocomponent impression technique with PVS.



CP1 - Fig. 14: Maxillary extra-hard gypsum master model with laboratory analogs. The project is to create a cobalt-chromium-PMMA full-arch Equator Bridge.





CP1 - Fig. 16-17: Maxillary bridge before the Seeger insertion (upper picture). The framework is made of cobalt-chromium alloy with a lost wax casting process. For didactic reasons, a section of a cobaltchromium implant abutment was created with an actual prosthetic anchor (lower picture): note the complete absence of contact of the abutment around the Equator sphere except for the closure at its marginal base. Mechanical retention is guaranteed by the Seeger ring that is visible in the cross-section.



CP1 - Fig. 20: Equator Bridge on patient.



CP1 - Fig. 18-19: Different Maxillary Equator Bridge compared to those described in image

17. The framework is melted in cobaltchromium alloy and each titanium abutment is prefabricated and glued to the framework with metal-on-metal glue. This bonding procedure can be performed on the master model or directly in the mouth. The Equator Extra Grade titanium Abutment (small picture) has an eccentric countersink that allows easy insertion even in the case of the lack of parallelism of the sphere.



CP1 - Fig. 21: Final orthopantomography. Despite the lack of parallelism, a very good prosthetic connection is detectable.



CP1 - Fig. 22: Clinical case concluded: maxillary cobalt-chromium-PMMA implant bridge and pre-existing mandibular removable partial denture. SECTION 3

Case Presentation 2



CP2 - Fig. 1: 79-year old patient with Parkinson's disease that was discovered in 2002. Chief concern: mobility of the lower implant supported OVD. Destructive wear and tear of ball attachment nylon caps occurred every 3-5 weeks. Bilateral osteoarthritis of TMJ and Eagle syndrome. Health care workers who provide home care could not manage RPD after the oral hygienc procedures.





CP2 - Fig. 2: Old orthopantomography (1998): patient with compromised dentition and lower complete dentures in occlusion with maxillary removable partial denture. DIAGNOSTIC SIGNIFICANCE OF AN OLD PROSTHESIS



CP2 - Fig. 3: Realization of OVD prosthesis on ball attachment. In 2000, patient did not accept a new maxillary prosthesis and his removable prosthesis was maintained.



CP2 - Fig. 4-5: Despite the clinical onset of Parkinson's disease in 2002, the appearance of dyskinesia and chronic jaw clenching, no prosthetic problem has been reported in 5 years. Since 2007, he has begun a history of muscular rigidity and dyskinesias with a serious deterioration in daytime parafunctional activity. Lower OVD in 2007: the chief complaint was instability of the mandibular denture caused by retentive deficit: the wear of the ball attachment was evident.



KEY POINTS OF THE TREATMENT PLAN WERE: + NO AESTHETIC NECESSITY, + POOR ECONOMIC CONDITION, + GREAT RELATIONSHIP BETWEEN PATIENT AND DOCTOR.

TREATMENT PLAN:

+ TRANSFORMATION OF THE OLD OVD INTO AN EQUATOR BRIDGE + FIXED PROVISIONAL PROSTHESIS.

A.Ekfeld: "Early experience of implant supported prostheses in patient with neurologic disabilities". Inc.J Prosthed 2005;18:132-8.



CP2 - Fig. 6: Orthopantomography from 2008: preparation of the mouth for maxillary fixed provisional prosthesis.

CP2 - Fig. 7: Orthopantomography from 2008, after 4 months: implantology with delayed loading of the two mandibular implants. New implants ensured the realization of a full arch fixed prosthesis.





CP2 - Fig. 8: Replacement, on 3 existing interforaminal implants, of the old ball attachments with new Equator Abutments; healing abutment on new implants in molar region.



CP2 - Fig. 10: Front view. Adapting mandibular overdenture on new Equator Abutments.



CP2 - Fig. 9: Occlusal view of Equator Abutment one week after implant placement of 3.6 and 4.6.



CP2 - Fig. 11: Master model with Equator Abutment on all mandibular implants: the strategic distribution of the implants and the retention offered by these abutments allow several fixed and removable prosthetic solutions. In this case, we chose a temporary prosthetic solution with only the Seeger ring (Toronto Snap).



CP2 - Fig. 12: Preliminary tooth for the provisional prosthesis: the yellow nylon caps allow quick management of prosthetic tests and eliminate the use of a prosthetic screwdriver.



CP2 - Fig. 13: Cobalt-chromium framework for temporary Toronto Snap prosthesis. The rigidity of the framework is a prerequisite. The critical step is the definition of the thickness of the framework at the level of the prosthetic cylinders, these areas, apparently very thick, may prove to be points of low resistance.



CP2 - Fig. 14: Replacement teeth in lingual view of the prosthetic framework.







CP2 - Fig. 20: Equator bridge before Seeger insertion.



CP2 - Fig. 21: Equator Bridge. Done by technician Marco Vannini, Rhein 83 Laboratory in Bologna.



CP2 - Fig. 22: Seeger insertion into the prosthetic cylinder.





CP2 - Fig. 24: Cutting of the Seeger handle.







CP2 - Fig. 27: Orthopantomography check. Provisional prosthesis in situ.





CP2 - Fig. 30-31: Fracture of the primary connector of the provisional prosthesis due to incorrect design. The choice of the composite tooth has proved inadequate: the parafunction resulted in multiple nicks on the front teeth.





CP2 - Fig. 34: Fractured surface: the thickness of the framework, at the level of the cylinder, appears insufficient.



CP2 - Fig. 35: Final mandibular prosthesis with cobalt-chromium framework and trade replacement teeth in PMMA.



CP2 - Fig. 36: New prosthesis on the master model.







CP2 - Fig. 39: Equator Bridge.





CP2 - Fig. 41: This simple prosthetic solution did not present technical or biological complications within five years. Most dentists with implant and prosthetic experience know that the management of a neurological patient may present some difficulties, but patient satisfaction at the end of the therapy is a human experience that rewards any effort. CP2 - Fig. 42: This case report, one of the first treated with Equator technique, we showed that it is possible to apply the Equator abutment as universal solutions suitable for both fixed and removable prosthesis. The Equator abutment and the Seeger proved versatile and simple alternative of great clinical efficacy.





Section 4

Case Presentation 3



Case Presentation 3



65-year old patient, smoker, no systemic disease to be reported, self-employed, presents a complete rejection of removable prosthetic solutions and reports having changed several dentists due to the excessive number of dental inconclusive sessions and dissatisfaction towards previous aesthetic devices. The patient has remained almost a year without any prosthesis chewing exclusively on healing abutments.

He has been treated with an Equator Bridge protocol in 4 sessions. Patient refused to be photographed until prosthesis occurred.

After the delivery of the prosthesis he dropped out of the hygiene program. The degree of satisfaction for the prosthesis was judged as satisfactory.



CP3 - Fig. 3 and 4: Equator Bridge full arch on master model.





CP3 - Fig. 1-2: Replacement of implant healing caps with Equator Abutments. The work plan included an economic and simple Equator Bridge prosthesis with cobalt chromium framework and trade teeth.

The key of this case report was the custom fitting of prosthetic teeth and the management of the smile aesthetics; the golden rules of the assembly of the teeth learned from the old masters of dentures have been of great assistance in the achievement of this case.

Paradoxically, the chief complaint of the patient was aesthetic and not functional.











CP3 - Fig. 12, 13, 14: Three degrees of smiles performed on the day of the Equator Bridge delivery.



CP3 - Fig. 15, 16, 17: Smiling patient after Equator Bridge delivery.

CP3 - Fig. 11: Case completed, Equator Bridge.



CP3 - Fig. 18: Orthopantomography: case concluded. Full arch maxillary and mandibular Equator Bridge.

SECTION 5

Case Presentation 4



Case presentation 4

CP4 - Fig. 1: 68-year old patient. No significant systemic disease. Shortened mandibular dental arch. TMD. Chief concern: improvement of maxillary denture retention. 25 year RPD wearer with satisfaction. The patient does not want hooks or exposed metal to be visible when smiling.





CP4 - Fig. 2: 25-year old RPD. Never madeany mandibular prosthetic therapy.



CP4 - Fig. 3: Preoperative Orthopantomography. Partial intercalated edentulism in the maxilla, and distal edentulous saddle in the mandible.





CP4 - Fig. 5: Treatment plan: new RPD mixed dental-implant anchorage. Notice the two post-extractive implants in the 1.2 and 2.2-positioned to improve denture retention. The two back molars (and their old total crowns) were maintained as pillars of the distal prosthetic extra-coronal conventional anchors.



CP4 - Fig. 8-9: Tightened Equator Abutment repeated with the same assembly process as the opposite implant.



CP4 - Fig. 6-7: Equator Abutment manually screwed on the implant.



CP4 - Fig. 10: Equator Abutment in situ to anchor the RPD. The Equator Abutment for RPD or OVD are golden in color thanks to the TIN coating (titanium nitride), which increases the surface resistance of the material and prevents wear.





CP4 - Fig. 13: Single-phase two-component pick up impression, using a PVS in a standard steel tray.



CP4 - Fig. 12: Choosing color of the replacement teeth with VITA standard.







CP4 - Fig. 16: Maxillary removable partial denture (RPD) trade teeth on cast cobalt chromium.



CP4 - Fig. 17: Two yellow nylon retention caps; in the molar region two Akers hooks with occlusal rests on the old prosthetic crowns.



CP4 - Fig. 18: The primary "U" connector was chosen in light of the simplicity of the repair in case central incisors need to be added.





CP4 - Fig. 20: Clinical image of the maxilla before prosthesis insertion.



CP4 - Fig. 21: Removable partial denture (RPD) on patient.





CP4 - Fig. 22-23: In similar cases of vestibular inclination of both implant abutments, the nylon cap can become flattened when inserting the Equator prosthesis. In these cases, the nylon cap can be refined with a surgical blade by removing the crushed section or, alternatively, a slight selective grinding of the Equator Abutment can be done. For educational purposes, the right image shows the amount of grinding (the thin layer of titanium nitride has been removed).





CP4 - Fig. 26: Physiological adaptation of the denture flange: at the level of the anterior maxillary, denture retention is ensured by anchoring the implant. The flange of the RPD is unnecessarily oversized. We recommend the reduction of the prosthesis so as to give the frenula more space.





Equator Profile Universal Abutments

Semper inops quicumque cupit Claudiano In Rufin 1,200.

(He who wants too much is always poor)



SECTION 1

Equator Profile Universal Abutments: Indications, Objectives and Principles

Introduction

Many writers have discussed the advantages of restorations that are held in place by screws as opposed to those held in place by cement.

In any case, the advantage of implant prostheses continues to be supported by the possibility of restoration in the case of technical or biological complications (Gervais MJ et al 2007).

These complications are relatively common, even with expert operators.

Literature relates many systems to guarantee the removability of implant-supported fixed prosthesis: retention screws directly in the implant, occlusal screws, lateral blocking screws, telescopic connections and screws for the removal of cemented prostheses, among others. However, the prosthetic removability can also present disadvantages in terms of cost increases and technical difficulty in overcoming serious disparellelisms. In addition, the access to screws can compromise the aesthetics of prosthetic front teeth or their resistance to substitute teeth fracturing.

Some writers sustain that cemented prostheses demonstrate certain superiority in terms of better adaptation of the framework, fewer issues with screw loosening and better resistance to esthetic veneers in composite or in ceramic materials.

We have closely evaluated this literature that supports the superiority of cemented prostheses and we do not have confirmation based on scientific evidence.

As for the treatment of patients with low incomes, it is absolutely necessary to be able to repair the prosthesis at a reasonable cost. Due to an ever-changing oral environment, it is necessary to maintain control of complications.

It is based on these elements that the therapeutic proposal was created and is described in the following paragraphs.

Forward

We have achieved a new alternative of universal abutments in order to make the process simpler, cheaper and functional even for technicians that are less experienced with the operating procedure for prosthetic prototype trials and distribution of prosthetic products. Our daily collaboration with odontology students and with assistants has allowed us to reflect on more than one occasion regarding the setup difficulties of the surgical or prosthetic field. This difficulty comes from the unawareness of implant components and the differences between the various systematic brands on the market.

This also causes daily issues when reordering surgical and prosthetic kits. In addition, dental technicians are often troubled with these issues and regard the implantology product catalogues as being too complex.

Furthermore, we would like to underline that many specific indications created by the industry itself (peculiarities of prosthetic abutments: for example removable prosthesis) have no further need to exist. We believe that the time is right for designing and completing a new universal abutment that is able to upend these barriers and allows clinicians and technicians to be in control of all operative phases while having an intuitive respect for past methods.

The Universal Equator Abutment system was created thanks to the collaboration of the authors with the Center of Research and Development of OT Dental Studio / R&D Rhein 83. Biomechanics and ergonomics of the Equator Abutment

The universal abutment was originally completed based on the sphere of the OT CAP normo (Rhein 83 srl, Bologna, Italy). The substantial change called for the elimination of the head and neck of the sphere and only the conservation of the equatorial part (thus, the name Equator) in addition to the center diameter of the sphere that has been threaded to house a connection screw dedicated to the fixed prostheses.

This is available for every type of implant and allows for the completion of many removable and fixed prosthetic solutions.

In addition, the Equator abutment is available for dental roots representing an original type of dental implant connection that will be described in the following part of this section.

The universal abutment is made of two distinct components: a cylindrical body that allows a connection with any type of implant and a spherical end that is modified and serves as a prosthetic connection and can function according to the different anchoring procedures chosen by the clinician. Therefore, an individual component can function both as a single attachment as well as a multi-functional abutment by covering many of the applications of the OVD and the majority of the fixed implant prosthetic cases.

The retentive extremity of the abutment can offer retention through the elastic connection with the caps in conventional nylon or can anchor a new type of acetal retention formed by a small, open ring called "Seeger", which has already been successfully used for decades in precision mechanics. This ring presents an adjustable retentive capacity to be chosen by the clinician and guarantees excellent stability of the prosthetic abutment as well as demonstrates effectiveness in the prevention of the abutment becoming unscrewed in the application of the fixed prosthesis.

The effectiveness of the Seeger springs in regards to the prevention of unscrewing issues has classified the connections of principal implant types according to the method proposed by G. Paes de Barros Carrilho and da Binon for the external hexagon connections.

The experimental phase studied the average ease of rotation and related it to a coded procedure of manually screwing and unscrewing in 3 phases. This confirms that, independently from the type of implant, the universal abutment associated with the Seeger spring demonstrated a prevention of loosening of the prosthetic screws that was significantly higher than the control group without the Seeger spring.

Therefore, the coupling of the Seeger ring with the Equator neck in the clinical practice demonstrates a surprising capacity of overcoming disparallelisms and guarantees a complete absence of strain with the components after being inserted. During the clinical experimental phase with actual patients, this characteristic was revealed as one of the peculiarities in the procedure and demonstrates an evident competitive advantage in comparison to the majority of brands that are on the market today.

Finally, the prosthetic screw that is on the head of the sphere completes the retention system according to the analogous methods offered by the multi-functional abutments in the market, but with an original difference that can be used according to the convenient criteria that will be described in the following paragraphs.

Indications

•Fixed Seeger bridge implant prosthetics on multiple implants

•OVD Seeger bar

- •OVD on single abutments
- •RPD for implant anchoring

Advantages

The business protocol for Equator has a unique characteristic in comparison to the marketing strategies of the past: it considers the fulfillment of clinical phases of a prosthetic implant as a precise and high quality craftsmanship by putting the producer at the service of the customer with a peculiar personalized product service.

In fact, often dentists and dental technicians are bound by a small range of prosthetic abutment heights and are forced to adapt their non-routine clinical cases based on the catalog availability without any possibility of using "personalized" pieces. This standardization has commercial reasons but penalizes the operative management of particular cases.

It has therefore been decided to make the methodology universal by producing Equator abutments for any fixture and for any implant diameter or height. Based on the client request, the manufacturer is available to complete any type of implant height (even for the production of single pieces) and to therefore contribute to the prosthetic personalization and in this last instance, to the resolution of atypical situations.

1. Simplicity of use:

In all of these applications, the protocol calls for the complete operative procedure of the clinical case to be finished in 2 or, at the maximum, 3 appointments. The ergonomic factor during the studio-laboratory procedure is strictly regulated for the rigorous control of operating times.

2. Respect for the biological width of the mucosalimplant barrier

The recommended procedure calls for screwing the universal abutment into the implant during the first or second surgical phase and to never remove it during the following phases. The titanium surfaces of the abutment (refined with a specific Ra surface value), will contribute to maintaining stability between the desmosomial and connective link of the periimplant junction. This approach allows for the construction of an epithelium-mucosal barrier around the implant abutment that will not be broken until the handover of the definitive prosthesis. We consider respecting the mucosal-implant barrier as defined with the "biological width" as one of the strong points in preventing the reabsorption of the bone periimplant. We wanted this result for two motives: ergonomics in regards to the management of the case and biological respect of a delicate interface according to the previous convincing animal studies by Abrahamsson.

3. Passive fit of the prosthetic framework

One of the more common problematic techniques in the field of implant prosthetics has been the precision and connection in the comparison of the handmade and industrial prosthetic components. The passive fit of the metallic framework on implant abutments has been attributed to machined pieces for long periods of time. On the other hand, it has largely been considered that the prosthetic structures obtained by lost wax casting procedures have presented bigger problems. This belief has brought about the development of hybrid methods of special machined abutments glued to casted frameworks with the precise objective of improving precision. In addition, the industry has proposed various operating methods to obtain the passive fit where a few examples include the techniques of electric discharge machining (EDM), CNC metalworking lathe or metal laser sintering rapid prototyping techniques.

With the Equator project, we wanted to design a wide range of prosthetic abutments for fixed implanted prosthetics that are completely passive, with connections between the abutment and the prosthesis using the Seeger ring and not influenced by the usage technique or the degree of disparrallelism of the implant.

The clinician, taking into account a longitudinal section of the complex abutment – the prosthesis – will note how the stability element will be the closure border of the abutment maintained in a central position by the Seeger ring and locked by the screw through the crown connection.

This peculiarity has brought about the consideration of some critical points in international literature regarding the longitudinal prognoses of the Toronto bridge prostheses after 20 years of clinical use. In fact, the high incidence of prosthetic body fracturing has emerged within the gold framework prosthesis. In subsequent studies on the other hand (also confirmed by our first-hand experience), pieces in commercially pure titanium are not exempt from this collateral effect, especially in the cantilever area.

Finally, the production costs of the CAD CAM technologies and of the principal industrial passivation techniques appear today as limiting factors for the diffusion of these methods and remain applicable to the Equator Technique.

4. Mechanical efficiency of the connection

The clinician can decide to proceed with a fixed or removable prosthesis with the same abutment.

For the removable prosthesis, the mechanical retention can take advantage of a replaceable cap in nylon and many degrees of retention marked with different colors. If the clinical case calls for a resilient bearing for the prosthesis, the conventional OT CAPs can be used. On the other hand, if there is a preference for retentive activity, nylon Equator caps can be used.

For the fixed prostheses, the acetal Seeger ring consists of a thin, open ring that is mechanically held from the prosthetic abutment and that is attached to the neck of the Equator. This is performed while it is open so as to act as a spring in order to enlarge the coverage of the Equator abutment and then return it to its original form once it is around the neck attachment. It is recommended to orient the opening of the ring at the corresponding point of the implant disparallelism so as to simplify the insertion movement of the manufactured prosthesis.

This last solution offers the clinician an additional opportunity: it is possible to modulate the retentive capacity of the Seeger by manually shortening the retentive arms of the small ring with a scalpel. This adjustment can result in assisting atypical situations or extreme implant disparallelisms.

Another interesting feature of the Seeger ring is its retentive strength. In fact, the clinician can achieve a secure and durable connection by simply using a small retentive ring without any prosthetic connection screws. This particular detail allows the realization of fixed full arch implant prostheses by avoiding drilling the teeth in esthetically noticeable areas.

Finally, with this anchoring system, the clinician and the technician should no longer be required to drill a hole for every screw for each individual implant and they will be able to conveniently formulate each individual prosthesis by inserting the screws only where necessary. There is obviously also the possibility to easily add screws if the clinical case requires such additions.

With a standard hypothesis of a maxillary Toronto Bridge with 6-8 implants, it is possible to insert 8 Seeger rings and only 4 prosthetic screws. This can occur in the posterior area in order to avoid the unaesthetic holes for the screws on the frontal teeth by having an elastic Seeger connection for the prosthetic retention in the front. In our practice, the elastic connection has allowed for a sensible reduction in time and both clinicians and students are able to carry out intermediary trials of prosthetic prototypes without having to screw or unscrew anything and use the same clinical procedure as with natural teeth.

Disadvantages

The method does not allow an anti-rotational connection and therefore it is not indicated for the single unit rehabilitation. It is therefore recommended to manage the single tooth with conventional prosthetic implant procedures.

In addition, this system was created for implant screwed solutions. A research project is currently in progress regarding the expansion of components for the use of cemented prosthetic implants, but at the time that this text was published, it was still not available.


Fig. 2: Equator Abutment with OverDenture (OVD) retentive cap. This particular section is a part of an Implant-Retained Removable Partial Denture (IR-RPD).



Fig. 3: Fixed implant prosthesis of the lower jaw; use of the snap ring allows the creation of either a removable denture or a fixed prosthesis. The clinician may choose to locate the holes for the passing screws through only a few points of convenience.



Fig. 4: Maxillary Equator Abutments a month after surgery.





Fig. 6: Master cast of a double arch complete rehabilitation with Equator System.

Equator Seeger Bridge full arch; in this particular position there is no passing hole for the retention screw.

Equator Seeger Bridge completely passive on the analogues. Fig. 7: OT Equator Biologic Abutment, the absence of a passage between the abutment head and the interior of the implant is a biological advantage because it reduces the contamination and bacterial proliferation inside the implant, favoring the desmosomal attachment and protecting the connective attachment.



Implant Disparallelism

Est quoque cunctarum novitas carissima rerum Ovidio Ex Ponto 3,4,51.

(The novelty is the dearest of all things)



Implant Disparallelism

Introduction

Frequently, in the clinical practice, it is necessary to use angled implants and correct the implant disparallelism, which represents a complicating factor of the operating procedures for both odontologists as well as for dental technicians.

Van Kampen already mentioned 10 years ago how the angle of implants could compromise the retention of isolated anchoring systems. In addition, with the case of angled implants, it has been described that the occlusal forces can generate greater stress than the screws can sustain.

The use of the "All on four" and "All on six" maxilla and mandible techniques and the "tilting implant" techniques are associated with standardized protocols that use abutments and that are specifically made for the correction of disparallelisms in immediate loading cases. The objective of reducing the prosthetic cantilever segment is described as a mechanical advantage in the operating procedure. Angled abutments allow for the correction of diverged implants between 17 and 30 degrees. However, the elevated costs continue to impede their use.

Tilted implants present a percentage of success for the implant that is similar to the conventional fixtures. It is an undeniable fact that the interoperative clinical management of these abutments is difficult even for expert clinicians.

The expectation for replacing them with conventional abutments in cases of inclined implants was also one of the principal objectives for our preclinical experimentation with universal Equator abutments.

We have studied this problematic situation at length and we have come to the conclusion that overcoming disparallelism needs to be a precise objective for universal abutments in all applied conditions, even in atypical and extreme cases. We have in fact supplied an array of cylindrical abutments for these clinical cases that are specifically intended for disparallelisms over 45°, which completed the preclinical in vitro experimental phase in May 2012. These abutments have a bevel of 50° on the circumference of the cylinder and allow the prosthetic insertion even in most atypical cases.

After an in vitro experimental phase on simulated disparallelisms, we continued on to the clinical experimentation phase of actual cases that we will present in this chapter. This allows for many advantages in overcoming disparallelisms and in extreme, non-routine and atypical cases, it can be the most convenient solution.

Thanks to generous technical intuitions, engineers have been allowed to research and develop a simple measuring instrument for extreme implant disparallelisms at the Rhein 83 Research and Development Center in Bologna (Italy). This has facilitated actual cases in eliminating human bias and obtaining realistic comparative evaluation data.

It is with this aim that we present some situations of extreme implant disparallelism, even though these cases are not common, but represent an excellent trial group for our clinical experiment.





The OT Equator Biologic Abutment allows for many advantages in overcoming disparallelisms and in extreme, nonroutine and atypical cases. SECTION 2

Case Presentation 1









Fig.1

Fig.2

Fig.3

CP1 - Fig.1-2-3: Overcoming the lack of implant parallelism, slight (Fig. 1), medium (Fig. 2) and severe (Fig. 3) is the strength of the Equator working philosophy. The method was designed to overcome obstacles and transform the disparallelism problem into an advantage of retention. SECTION 3

Case Presentation 2









CP2 - Fig. 4: A panoramic view of the mandibular arch: metal ceramic fixed prosthetic restoration on 3.4 and 3.5 elements with distal cantilever of 36, supported by natural sunk pillars.



Fig. 6: Preoperative panoramic radiograph: the chief complaint of the patient was to reestablish only the function of the left lower molar region without changing the previous restoration.







CP2 - Fig. 9: Immediate post-extractive implants and intraoral radiographic verification of the safety distance from the inferior alveolar nerve at the foramen emergence point.



Suture of the flap for transmucosal healing of Equator Biologic Abutments.



CP2 - Fig. 15: Rotational transfer for pick-up impression. This clinical case report has been chosen to demonstrate the great capacity of exceeding the divergence with the Equator technique.



CP2 - Fig. 16: Equator transfers.



CP2 - Fig. 17: Disparallelism amplified by the particular inclination of the implant transfer screw.



CP2 - Fig. 18: 4 transfers for pick-up impression.



CP2 - Fig. 19: Single-phase two-component impression (pick-up) on individual tray (Elite HD + mono Hidrorise light).



CP2 - Fig. 20-21: Clinical details after impression steps: (left) maturation of the gingival tissue a few months after surgery and (right) the particular pick up impression transfer.









CP2 - Fig. 28: It is advisable to have the white Seeger ring on all 4 slots regardless of the presence of the implant screw. Prior to insertion in the oral cavity two pink Seegers will be included in the 3.5 and 3.7.





CP2 - Fig. 30: FPD in situ before obturation of occlusal holes. The Seeger connection system + prosthetic screw allows one to keep all the advantages of a screw retained prosthesis. The clinician will be able to remove the restoration without difficulty at any time, and re-insert it without the need to replace any constituent. Seegers are not subject to wear over time and are not hygroscopic.





CP2 - Fig. 33: Case completed after 1 year of oral function.

Section 4

Case Presentation 3

IMPLANT DISPARALLELISM

CASE PRESENTATION 3



Clinical case entirely done by dr. Andrea Berzaghi DDS, PhD, in the second year of the program of education High Mechanics, Automotive Design, Technology and Biomaterials of the Graduate School "Enzo Ferrari" of the University of Modena and Reggio Emilia. Tutor Prof. Sergio Bortolini.



CP3 - Fig. 1, 2, 3: Clinical case of partial edentulism. 50-year old patient, craftsman, smoker, complains of difficulty chewing in the posterior region of the mouth. Requires fixed prosthetic restoration and restoration of stomatognathic function. No need for aesthetics. Average economic capacity.



CP3 - Fig. 4-5: Edentulism with bilateral distal outcomes of structural failure of the previous fixed prosthesis. Chief concern: functional recovery through fixed implant prosthesis (FPD). The patient did not have any aesthetic requirement.

















CP3 - Fig. 24, 25, 26: Lower left prosthesis. The prosthesis will be anchored with 3 Seegers and will be screwed on just two implants. This solution will prevent a screw hole passing through the center of the buccal surface of 3.4 and solve the problem of convergence implant without any recourse to mesostructures or customized abutments. This prosthesis does not present any tilting and ensures an optimum level of marginal fit on all pillars.



CP3 - Fig. 27-28: Lower right FPD. The good parallelism allows you to create a fixed prosthesis by classical framework veener with the occlusal surface in Y-TZP on both elements to protect the cusps and prevent chipping phenomena. The mode of anchoring involves the two Seegers and 2 screws.



CP3 - Fig. 29: Clinical case in frontal view. Above is the preoperative image and below is the completed implant restoration of the posterior region.





CP3 - Fig. 32-33: The maxilla was treated with a toot-implant connection; in the mandible was demonstrated the overcoming of the disparallelism with an Equator Bridge solution.



Section 5

Case Presentation 4







CP4 - Fig. 2: Equator Abutments disparallelism.



CP4 - Fig. 3-4: Master model, extra hard gypsum type IV: parallelism of Equator Abutments appears to be underestimated in occlusal view (left) and in the sagittal plane (on the right).



CP4 - Fig. 5: For demonstration purposes the long screws were tightened to view the convergences of implant in the sagittal plane.



CP4 - Fig. 6: The degree of parallelism can be defined as severe. This clinical condition, often when we resort to short implants in the posterior mandible, is a difficult problem to solve and often requires the use of customized individual pillars that increase the cost of the prosthetic treatment.



 CP4 - Fig. 8-9: Metal-ceramic Equator Bridge on the master model in

CP4 - Fig. 8-9: Metal-ceramic Equator Bridge on the master model in occlusal view (left) and detail of the connection (right) prior to insertion of the Seeger. There was no need to resort to any prosthetic custom component.



CP4 - Fig. 10: Equator Bridge lateral view.





SECTION 6

Case Presentation 5





CP5 - Fig. 2: Intraoperative Orthopantomography: patient with lower FPD and maxillary RPD implant retained; the two maxillary ball attachments are not interchangeable because of final cementation on implants.



CP5 - Fig. 4: Two ball attachment OT CAPs crafted with prosthetic anchorage function.



CP5 - Fig. 3: RPD implant retained. The remaining natural teeth, with periodontitis, have mobility and migrated towards buccal.



CP5 - Fig. 5: The patient was subjected to maxillary implantology according to all-on-four protocol with immediate loading; multi-unit Branemark abutments that are straight and angled; two older surviving implants were maintained.







CP5 - Fig. 7: The survival of the two old implants and their recovery for the purpose of prosthetic support of the new full arch prosthesis presents considerable technical difficulties. It was decided to replace the MUA with Equator Abutments and analyze possible solutions.



CP5 - Fig.10: Master model. The severe degree of disparallelism is clear.



CP5 - Fig. 11-12: Provisional prosthesis cobalt-chromium casted and acrylic mink bite. The parallelism has been exceeded, as demonstrated by the screw holes through the molars, also thanks to the retention offered by the Seeger; it was possible to avoid the unsightly holes at the center of the labial surfaces of the incisors. Extragrade eccentric aperture facilitates the definition of the insertion and ensures absolute framework passivity.



CP5 - Fig. 15: This case shows how the connection can overcome multiple disparallelisms without resorting to angled abutments. This results in ease of use and cost containment.



CP5 - Fig. 13-14: Six prosthetic connections visible. The 4 Equator Abutments at the ends of the polygon ensure retention and aesthetics and allow for reduction in the number of occlusal holes and consequently of the prosthetic screws (right). Detail of the cylindrical extra grade abutment indicated in severe implant disparallelisms.







Operative Procedures and Impression Techniques

Curiosus spectator excutit singula et quaerit Seneca,Nat.quaest.praef.,11.

(The observer eager for knowledge, searches and studies every little thing)



Operative Procedures and Impression Techniques

This textbook comes from our conviction that implant protocol for prostheses needs to be simple, practical and predictable even in the hands of a standard operator. Furthermore, the recent economic crisis is imposing a "style" shift to many clinical operators and today no practitioner can be allowed to ignore the social dentistry solutions.

This textbook criticizes the conviction that the social prosthesis is removable and poor and the implant rehabilitation is of a higher level and expensive. There are many successful alternatives, which for many years have been the subject of experimentation by chemical and mechanical engineers.

This textbook is an invitation for the reader to consider the mechanical and biological advantages of some new procedures that can reduce elaboration time, dentist stress and patient discomfort. No reader can consider that the techniques presented here are applicable to all clinical cases or can they replace the classical protocols without an adequate learning curve.

We also made the decision to present some of our mistakes and side effects and we are willing to discuss any future issues related to the clinical application of the procedures.

This final chapter shows two clinical cases that are treated step-by-step to introduce the dental technology management and selection criteria of the solutions employed.

The contribution of our dental technicians colleagues has been very valuable and many of the unique Equator component features resulted from their reasoning and their ingenuity.

We have had an enormous amount of support from the industry in the implementation of our implant research project and we were able to conduct experiments in vitro and in vivo with the majority of the materials that you will see used.

Without them, this eBook would not have been written, nor translated into 7 languages. In addition, it would not have been possible to disclose it for free.

The reader should, however, consider the experimental value of some of the cases presented and it is with this criterion that the clinical cases of this last chapter were selected.

Certainly many of the most virtuous clinicians and technicians, the opinion leaders of international implant companies and most experienced academics will find some of the solutions proposed in this book controversial. However, we aimed at improving the life conditions of our patients, often by applying solutions that we would have applied to our own family or to ourselves and believing that, in a difficult profession like ours, it is useful to respect the diversity of opinion by constantly maintaining the freedom, the right and the desire to change ones mind in respect of better proposals.

Almost all clinical cases presented have a follow-up of at least 5 years.

In this period we have presented the procedure and preliminary data published in 6 Congresses of the International Association for Dental Research (IADR): Miami (USA), Barcelona (Spain), San Diego (USA), Foz de Iguacu (Brazil), Seattle (USA), Cape Town (South Africa) published in the Journal of Dental Research and in at least 20 National Conference events.

Many dentists and dental technicians have tested our procedures with excellent results. We hope that our efforts will make a positive contribution to the readers of this book.

Impression techniques for implant rehabilitation

Introduction

The necessary operative procedures for rehabilitating an implant case are varied and can be classified according to difficulty level in three main groups according to the development phases of the clinical case:

- 1. Pre-surgical impressions;
- 2. Surgical or intraoperative impressions;

3. Post-surgery or final impressions, taken after complete recovery of the peri-implant tissue.

The accuracy of the impressions is influenced by a wide range of factors such as the choice of materials and their handling, technique of the impressions, choice of the impression tray, design of the impression tray, deformation of the impression, retention of material on the impression tray, the thickness and removal of the impression, the temperature mutations after the removal, disinfecting solutions and immersion times, model materials and their compatibility with the chosen impression material.

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Furthermore, by eliminating dental movement that depends on the width of the periodontal ligament, it will increase the impression grade of precision as with the implant FPD.

Even the standardized or personalized impression trays have a key role: impression trays that are customized allow for the calibration of the material thickness and make the material contraction uniform; on the other hand, the standardized impression trays could cause heterogeneous pulling of the material due to different thicknesses of the elastomer, even though these trays are more affordable.

Finally, the rigidness of the impression tray is a key factor in cases with high-viscosity materials such as putty.

In regards to operating techniques, there are single-stage impression techniques that are taken with a one-time access to the oral cavity, as well as double impressions or two-stage impression techniques that are normally placed in the oral cavity more than once and that require a specific viscosity of the impression material for each phase. These last options are not often used (even though they can be utilized in cases of implant repositioning impressions) due to the difficulty of reinserting the impression for the second stage.

In implant prosthetics, the single stage (one or two viscosities) techniques are used more frequently. In this case, two materials of different viscosities are placed in the oral cavity: the low viscous material for the periodontium area and the higher viscous material is to be placed in the impression tray as a pressure factor. The hydrophilicity of the metal surfaces of the transfer copy creates a large factor of disturbance and is generally associated with the difficulty of intraoral control of the humidity in the oral cavity.

The possibility of obtaining an undesired interface of saliva or blood between the surfaces of the transfer and the impression material (that is generally hydrophobic) causes the risk of movement of the transfer during the extraoral fixing procedure laboratory replica with the concrete risk of hindering the entire procedure in the case of a pick-up impression.

A series of accessory techniques were created with the objective of excluding this critical situation. In reference to the pick-up impression, many Authors have described techniques for increasing the mechanical retention of the transfer or splinting systems between the transfer copying with inter-implant bindings made of resin, composite or gypsum rigid splinting materials.

In any case, even splinting materials present limits such as contractions during the liquid to solid phase change of the material or hygroscopic expansion and require particular tactics in order to be regulated.

Other clinicians believe in the precision of intraoral soldering of titanium transfers or the digital optical impressions with digital technologies that, apart from the captivating the perspective, do not seem suitable for routine outpatient use.

Our work group has a preference for the multiple implant impression without resorting to rigid fixing techniques except in particular rare cases. We have realized modifications of implant components associated with simple techniques in order to increase the hydrophobicity of the transfer and we generally work with set viscosity level materials that maintain elastic characteristics after the bite. These materials offer important advantages while removing the impression from the oral cavity and above all in cases of multiple implants with internal connections.

The rinse and immersion disinfection procedures have also been encoded according to a specific protocol. Ultimately, the gypsum used for models is chosen so as to compensate for the polymerization contraction of the impression material with the polymerization expansion of the gypsum.

We believe that science and the usage techniques (often considered the 'Cinderella' in the dental branches of study) of the materials are able to offer excellent results in terms of precision.

Reading the paper illustrations of the impression materials and models should be similar to a pharmacist reading the indications and counterindications that are described on the box next to the precautions and side effects.

Pre-surgical impressions

Pre-surgical impressions have to do with the final impressions after the completion of necessary case study diagnostic models, the completion of diagnostic mock-ups, temporary prostheses and diagnostic, surgical or individual impression tray guide.

According to recent regulations, it is recommended that each operator observe, develop and conserve the diagnostic models, even after the reconstructive therapy plan has been completed in an appropriate gypsum archive. Such prudent astuteness will allow the conservation of the initial state of the clinical case and discussion of the therapeutic conduct of the operator, even in the case of legal controversy. Traditionally, these impressions are obtained in irreversible hydrocolloid for convenience and low price. More recently, and following frequent duplication requirements of preliminary studio models for prosthetic implant therapy, it has been commonplace to use Vinyl Poly Siloxanes (VPS) that present many advantages in terms of dimensional stability, recovery from deformation and precision in the case of future model developments. The most evolved VPS allow for clinical effectiveness even in cases of residual tooth mobility without concrete risks of accidental tooth loss.

As a rule, this operating approach is recommended for both arches. In fact, by having a copy available of the opposing arch model, it can be of great assistance in the management of the implant treatment plan.

On the other hand, the VPS diagnostic impressions allow for noteworthy precision in the reproduction of details and above all in the techniques of double impressions. They allow for the effective elimination of superficial defects of the gypsum model that are not obtainable with the majority of alternative elastomers on the market. According to our operating protocol, the VPS preliminary diagnostic impression in the rigid steel impression tray is developed two times and conserved for the entire period of the implant prosthetic therapy plan. The first development constitutes as a diagnostic model and the second is reserved for pretreatments such as a diagnostic or surgical guide, a temporary prosthesis or other objectives. Surgical or intraoperative impression

This impression is taken with open flaps after the placement of the implants in the oral cavity. This represents a key step in making the temporary prosthesis for immediate loading. It allows a direct precision check of the fit between the prosthetic abutment and the transfer. This type of impression offers many operative advantages in a short period of time.

This technique, realized with specific sterile and radiopaque VPS (Elite Implant, Zhermack spa, Badia Polesine (RO) Italy), is certified for use with direct bone and periostieum contact. This was the subject of our book published in 3 languages in 2008 (Bortolini S, Consolo U, Rossi R. "IMPRONTA IN IM-PLANTOPROTESI". Testo Atlante. Teamwork media editore. Brescia 2008, ISBN/EAN: 9788889626047). The authors personally conducted all of the pre-clinical and clinical experimentation phases and studied the direct and indirect toxic tests in collaboration with the General Pathology Institute of the University of Modena and Reggio Emilia directed by Professor Roberta Tiozzo. The comparative tests between the VPS of the Elite Zhermack brand and the 3MEspe polyethers and Heraeus-Kulzer polyethers were conducted on three different types of fibroblast cells: 3T3 cells, human dermis and gingival fibroblasts.

This technique is applicable with ease in all clinical conditions. After making the complete casting model, it is possible to set up the standard articulator in a short period of time thanks to simple bite registration. The procedure allows for the completion of a temporary prosthesis with an indirect technique of complete dental arches with metallic framework that is incorporated in 2-4 hours for immediate loading implant cases.

The clinical cases described in this eBook demonstrate the advantages of the technique and describe step-by-step instructions.

Naturally, the advantages of the intraoperative impression are evident even for implant prosthetic clinical cases with delayed loading.

Delayed implant impression

This impression is realized after the healing period of the periimplant tissues. Normally, this requires the maximum precision acquisition of the mucogingival peri-implant area. The gypsum casts can be perfected thanks to removable silicon materials.

The delayed implant impression has many variants and can be made with various techniques: the most common are the pickup techniques with an open impression tray and the indirect impression with a closed impression tray.

Many clinicians prefer to utilize the single impression tray and/or various splinting techniques of the implants using rigid materials such as resin, composites or gypsum. The most demanding cases are the multiple teeth and implant abutment impressions for fixed prostheses. In fact, the clinician needs to simultaneously manage the gingival retraction techniques, the saliva restraint and the impression of all abutments.

There are many critical factors to consider in order to obtain the maximum level of precision of the gypsum model. The clinician needs to fall back on standardized methods for verification of the correct insertion of the implant components. In addition, the clinician needs to carefully consider the material properties such as the contraction coefficients of the chosen VPS, the dimensional modifications of the impression materials at 24-48 hours, the linear expansion coefficients of the gypsum used in creating the model and the hardening time periods so as to release the impression from the model without fracturing abutments or remaining teeth.

There are very few companies that are able to offer the clinician the specific materials for impressions and models in order to reduce discrepancies between intraoral situations and gypsum models.

In the photogalleries that follow, the impression techniques described in the text will be demonstrated.

Conclusions

We always hated the invasive scientific research applied to experimental animals. In the course of our research project we decided not to perform tests on animals.

You decide if the result is convincing. Our primary goal is making the implant and prosthetic sessions short, effective and more enjoyable for dentists and patients alike by simplifying the work for clinicians, technicians and patients and abolishing the word "martyrdom" for monkeys, mice, sheep, dogs and even "us."

We have worked on patients and we have focused our attention on their human side. All the cases presented here are patients who, in addition to consenting, were proud to have participated in our experiment on the Equator project.

As we have worked to not disappoint them, this book is therefore dedicated to them.

There are two other rightful dedications: the first to the readers of this eBook, the first of our experience as editors; and the second to our dental technician friends who have shared our toil, they deserve this final chapter.

We dedicate to the dentists and readers a comment by Freud that still resonates, taken from "Introduction to Psychoanaly-sis":

"You have been trained to reduce the functions of an organism and its disorders anatomically, to explain them in terms of chemistry and physics and to conceive them biologically, but no portion of your interest has been directed to the psychic life, in which, after all, the activity of this wonderfully complex organism culminates. For this reason psychological thinking has remained strange to you and you have accustomed yourselves to regard it with suspicion, to deny it the character of the scientific, to leave it to the laymen, poets, natural philosophers and mystics. Such a delimitation is surely harmful to your medical activity, for the patient will, as is usual in all human relationship, confront you first of all with his psychic facade; and I am afraid your penalty will be this, that you will be forced to relinquish a portion of the therapeutic influence to which you aspire, to those lay physician, nature-cure fakers and mystics whom you despise."

Then, as dentists we also have a faithful "abusive psychoanalyst" who is constantly with us: our dental technician. It studies and supports us. It gives us satisfaction and irritation, understands and sympathizes with us. Sometimes it loves us and other times betrays us. Sometimes it helps to dispel our ghosts and those of others.

With him, we spend more time than with our families.

This chapter is dedicated to all dental technicians.

Good luck to all. Sergio, Alfredo, Maurizio SECTION 2

Case Presentation 1

OPERATIVE PROCEDURES **CASE PRESENTATION 1**

Case Presentation 1

65-year old patient, A. B., suffering from CADASIL and dyskinesia, complains of severe eating difficulties and dysphagia. Unable to use the old removable dentures. It was recommended by a neurologist to use a fixed implant prosthesis. A warning of reduced density of the maxillary jaw bone due to peripheral systemic microangiopathy, which needs to be courageously addressed with state of the art therapy (Courtesy of Dr. Dario Boccato MD, DDS, Stienta (Rovigo) Italy).



 A.Ekfeld: "Early experience of implant supported prostheses in patient with neurologic disabilities." Int J Prosthod 2005;18:132-8.
 A.Ekfeld, M.Zellmer, G.Carlsson: "Treatment with implant supported fixed dental protheses in patients with congenital e acquired neurologic disabilities. A prospective study." Int J Prosthod 2013;33:517-24.

CADASIL: Cerebral Autosomal-Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy

CADASIL: This disease belongs to a family of disorders called the Leukodystrophies. The most common clinical manifestations are migraine headaches and transient ischemic attacks or strokes, which usually occur between 40 and 50 years of age.

Signs and symptoms: CADASIL may start with attacks of migraine with aura or subcortical transient ischemic attacks or strokes, or mood disorders between 35 to 55 years of age. The disease progresses to subcortical dementia associated with pseudobulbar palsy and urinary incontinence.

Etiology: The most common form of hereditary stroke disorder, and is thought to be caused by mutations of the Notch 3 gene on chromosome 19.

Exams: Genetic exams on biopsies of the skin; an MRI is able to detect signs of the disease years prior to the clinical manifestation of disease.

Differential Diagnosis: These lesions are concentrated around the basal ganglia, periventricular white matter and the pons, and are similar to those seen in Binswanger disease.

Therapy: No specific treatment is available.

CADASIL: Cerebral Autosomal-Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy

Bibliography

- A del Río-Espínola A, Mendióroz M, Domingues-Montanari S, Pozo-Rosich P, Solé E, Fernández-Morales J, Fernández-Cadenas I, Montaner J. (febbraio 2009). CADASIL management or what to do when there is little one can do. Expert Rev Neurother. 9: 197-210.
- A Reyes S, Viswanathan A, Godin O, Dufouil C, Benisty S, Hernandez K, Kurtz A, Jouvent E, O'Sullivan M, Czernecki V, Bousser MG, Dichgans M, Chabriat H. (2009). Apathy: a major symptom in CADASIL., Neurology. 10: 905-10.
- ^ Joutel A, François A, Chabriat H, Vahedi K, Andreux F, Domenga V, Cecillon M, Maciazek J, Bousser MG, Tournier-Lasserve E. (2000). CADASIL: genetics and physiopathology. Bull Acad Natl Med. 184: 1535-42.
- <u>^</u> Dziewulska D, Kwieciński H. (2008). CADASIL syndrome cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy. Neurol Neurochir Pol. 42: 123-30.



CP1 - Fig.1-2: Pre-op situation. The neuromotor deficits associated with acquired macroglossia and insufficient retention of the old dentures make it impossible to chew and significantly decrease the quality of life of the patient.







CP1 - Fig. 4: Patient is partially edentulous at the upper jaw, with a Kennedy class I.



CP1 - Fig. 6-7: Old dentures on the study models; the diagnostic meaning of the old rehabilitation must be kept in high consideration.





CP1 - Fig. 13: Mandibular implant for delayed loading: 4 interforaminal implants and two short back-foraminal implants.



CP1 - Fig. 11-12: Realization of the surgical provisional prosthesis for maxillary and mandibular full arch implant prosthesis on the articulator: frontal and lateral projection.



CP1 - Fig. 14: Detail of the 6 pick-up transfers for impression on the Equator Biologic Abutment.





CP1 - Fig. 16: Transfer splinting with self-curing composite Acrytemp (Zhermack spa, Badia Polesine, Rovigo - Italy).



CP1 - Fig. 17: Self-curing acrylic resin individual tray; coating the inner surface with specific adhesive Elite Iperlink SCT (Zhermack spa, Badia Polesine, Rovigo - Italy).



CP1 - Fig. 18: Mono-phase dual-component pick-up impression with PVS Elite HD Mono + Hydrorise Light (Zhermack spa, Badia Polesine, Rovigo - Italy); the blue utility wax closes the window of the tray. The heads are visible of the long transfer screws.



CP1 - Fig. 19: Detail of the splinted transfer pick-up impression; this image was taken after the development of the master cast.





CP1 - Fig. 20: Extraction of the residual elements and positioning of maxillary implants in conscious sedation. The bone quality D4 has made it difficult to achieve primary stability of the implant in the majority of surgical sites despite a generous under-preparation of implant sites. For this reason it was considered prudent to increase the number of implants compared to our usual work protocol. Intraoperative positioning of the Equator Biologic Abutment.



CP1 - Fig. 22: Pick-up Equator transfer.



CP1 - Fig. 23: PTFE oral floss that links the transfers, for the pick-up splinted coping impression technique.



CP1 - Fig. 25: The oral floss has simplified the application phases of the composite and provided support during the polymerization of the material.



CP1 - Fig. 24: Transfer splinting with self-curing Acrytemp composite (Zhermack spa, Badia Polesine, Rovigo - Italy). It is convenient to put a small amount of composite to minimize the effect of curing shrinkage.



CP1 - Fig. 26-27: Self-curing acrylic resin individual tray; coating the inner surface with specific adhesive Elite Iperlink SCT (Zhermack spa, Badia Polesine, Rovigo - Italy); the tray has been previously sandblasted to increase retention.



CP1 - Fig. 28: The blue adhesive is easy to detect and needs to homogeneously cover the inner surface of the tray.



CP1 - Fig. 30: Mono-phase mono-component surgical impression. It is possible to see the detail of the splinting area between transfers. The two distal implants are intentionally excluded from the impression as they are not involved in the immediate loaded provisional prosthesis.



CP1 - Fig. 29: Mono-phase mono-component pick-up impression with sterile and radiopaque PVS impression material: Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo - Italy).



CP1 - Fig. 31: These pre-surgical provisional prostheses are rebased upon the Equator Abutments in centric occlusion with Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo -Italy). This simplified registration allows for mounting of the master casts in the articulator.







CP1 - Fig. 34-35: Details of the two provisional prostheses with wire framework.



CP1 - Fig. 38: Clinical image 2 months after surgery. Equator Abutments have never been removed; the clinical situation was satisfactory and oral function had a marked improvement. In the left image it is possible to see the two distal implants excluded from the immediate loaded provisional prosthesis.





CP1 - Fig. 41: The repositioning template is made upon the master cast and delivered to the clinician with two (or more) fixed abutments and holes over the position of the other implants. The abutment is then screwed into the mouth and the position verified thanks to an x-ray. The abutment is placed on the template with the resin. With this template, it is possible to check the position of the analogues on the master cast and eventually correct the position.



CP1 - Fig. 40: After an RX check, it is possible to correct the master cast thanks to the repositioning template. In this way, correction of the problem of the previous image is possible, in addition to understanding if the abutment is loose during the healing phase or was mispositioned at the beginning (usually due to a small piece of bone). During this phase it is possible to include the position of the integrated distal implants and to correct the master cast.



CP1 - Fig. 42: The distal implant abutment is splinted to the template thanks to the self-curing Acrytemp composite (Zhermack spa, Badia Polesine, Rovigo, Italy).



CP1 - Fig. 43, 44, 45, 46: X-ray check of the correct positioning of the Equator Abutments on implants; in the upper jaw the template is visible.



CP1 - Fig. 47: Master cast before the correction; thanks to the template described in the previous images it is possible to verify the precision of this cast and add the missing distal analogues.



















CP1 - Fig. 58-59: Definitive Equator Bridge of both jaws and first check of the occlusal contacts in the articulator.



CP1 - Fig. 61: Detail of the anterior part of the maxillary prosthetic body that closes the "s" channel.



CP1 - Fig. 62: Maxillary clinical view 6 months after the surgery; Equator Abutments have never been removed.



CP1 - Fig. 64: Clinical view 6 months after the surgery; Equator Abutments have never been removed.



CP1 - Fig. 63: Mandibular clinical view 6 months after the surgery; Equator Abutments have never been removed.





CP1 - Fig. 69: Maxillary Equator Bridge with cobalt chromium framework and PMMA body and teeth.



CP1 - Fig. 70: Equator Bridge; the white Seeger springs are visible.



CP1 - Fig. 71: Clinical image of the maxillary Equator Bridge.



CP1 - Fig. 72: Mandibular Equator Bridge with cobalt chromium framework and PMMA body and teeth.





CP1 - Fig. 74: Clinical image of mandibular Equator Bridge.







CP1 - Fig. 77-78-79: The microphotography of the section of the connection (Implant - Equator Biologic Abutment - Prosthetic Abutment) explains the peculiarities of this anchor, which consists of Seeger spring plus a prosthetic screw. Notice how the inside of the prosthetic abutment is completely passive, only allowing contact on the edge of the Equator and on the Seeger spring (which is seen in white).



CP1 - Fig. 80: Detail of the anterior part of the maxillary prosthesis.







SECTION 3

Case Presentation 2



CP2 - Fig. 1: Patient S.G., 47 years old.

Case Presentation: Compensated diabetes, severe autoimmune liver disease with cirrhosis, systemic arthropathy with motor deficit in the lower limbs, depression. Fully edentulous for the past three years, could not accept the removable denture. Chief concern: elimination of the prosthetic palate on the upper jaw, restoration of masticatory function, desires white teeth.







Ring basis

CP2 - Fig. 6: OPG that shows the full edentulism with Eagle syndrome of the condyles.











CP2 - Fig. 18: Detail of patient's smile with the old prosthesis.



CP2 - Fig. 16-17: Lateral view of the smile of the patient with the old prostheses; note the unnatural mandibular protrusion.





CP2 - Fig. 21-22: Study casts in the articulator. On the mandibular edentulous model a transparent vacuum-plate of the old prostheses is present; all models are cross-mounted in the same articulator for diagnostic purposes. In this way, it is possible to evaluate the relationship between the two arches even on the sagittal and the occlusal plane in addition to projecting a safer biomechanics for the rehabilitation of either immediate or delayed loading.



CP2 - Fig. 23-24: Self-curing acrylic individual windowed impression tray.



CP2 - Fig. 25-26: Transparent vacuum-plate of the old prostheses; this template can be rebased in PVS in centric occlusion and can give a first occlusal registration that allows mounting the master cast in the articulator after the surgery.



CP2 - Fig. 27: Detail of the surgery: manual screwing of the first threads of the Duravit 3P implant (B&B Dental srl, S. Pietro in Casale, Bologna, Italy). On the right the surgical kit is coded by color, the color of the last drill is the same of the implant mounter (e.g. the last drill is green and the mounter of the implant is green as well).



CP2 - Fig. 28: Detail of the manual screwing of the implant with the torque wrench included in the surgical kit.



CP2 - Fig. 29: Details of the implants in the lower jaw; note the dark signs on the bone that comes from the mental foramen; Duravit 3P implants (B&B Dental srl, S. Pietro in Casale, Bologna, Italy).



CP2 - Fig. 30: Transfer coping pick-up for PVS surgical impression.



CP2 - Fig. 31: Clinical test of the impression tray.





CP2 - Fig. 33: Surgical impression with sterile and radiopaque PVS Elite Implant Heavy (Zhermack spa, Badia Polesine, Rovigo, Italy) on dried transfers.

FOLLOWING IS THE SEQUENCE OF SURGICAL PICK-UP IMPRESSION PROTOCOL WITH STERILE AND RADIOPAQUE PVS WITHOUT TRANSFER SPLINTING.



CP2 - Fig. 34: Detail of the material around the transfer; in this case it was not necessary to splint the transfer with composite resin.







CP2 - Fig. 36-37: The details of the implant impression techniques have been described earlier in this publication.







CP2 - Fig. 41: Transparent vacuum-plate for occlusal registration with PVS Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo, Italy).



CP2 - Fig. 42: Transparent vacuum-plate for occlusal registration with PVS Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo, Italy).



CP2 - Fig. 43: Template in centric occlusion for the registration of the position of the jaws.



CP2 - Fig. 44: This procedure allows for mounting of the lower jaw master cast in the articulator, simplifying the immediate realization of the provisional prosthesis.



CP2 - Fig. 45: Post-op OPG; it is possible to notice the switching platform healing abutments upon Duravit 3P implants (B&B Dental srl, S. Pietro in Casale, Bologna, Italy).

FOLLOWING IS THE SEQUENCE OF DELAYED PICK-UP IMPRESSION PROTOCOL UPON EQUATOR ABUTMENTS WITH TRANSFER SPLINTING.



CP2 - Fig. 46: Transfer upon Equator Abutments.



CP2 - Fig. 47: PTFE oral floss that links the transfers, for the pickup splinted coping impression technique. The floss supports the composite resin during the curing period.



CP2 - Fig. 48: Transfer splinting with self-curing composite Acrytemp (Zhermack spa, Badia Polesine, Rovigo, Italy). It is convenient to place a small amount of composite at a time to minimize the effect of curing shrinkage.



CP2 - Fig. 49: Transfer splinting with self-curing composite Acrytemp: to minimize the effect of curing shrinkage, and to obtain the highest precision, the splinting is done in two phases: 1. put the material around the transfer leaving a space free of composite between transfers.



CP2 - Fig. 50: Transfer splinting with self-curing composite Acrytemp: to minimize the effect of curing shrinkage, and to obtain the highest precision, the splinting is done in two phases: 2. complete the framework with a second increase of material; in this way there is maximum precision.



CP2 - Fig. 51: Transfer splinting with self-curing composite Acrytemp (Zhermack spa, Badia Polesine, Rovigo, Italy): phase completed.



CP2 - Fig. 52: Detail of the mono-phase, mono-component impression with Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo, Italy).



CP2 - Fig. 53: Lower jaw master cast with Equator Abutments upon laboratory analogues Duravit 3P (B&B Dental srl, S. Pietro in Casale, Bologna, Italy).



FOLLOWING IS THE SEQUENCE OF DIRECT TRANSFORMATION OF THE OLD PROSTHESIS IN TOTAL IMPLANT OVD ANCHORED TO THE 4 EQUATOR ABUTMENTS.





CP2 - Fig. 56-57: Yellow Equator retentive caps and their clinical position.



CP2 - Fig. 55: Equator Abutments on Duravit 3P implants (B&B Dental srl, S. Pietro in Casale, Bologna, Italy).





CP2 - Fig. 58-59: Provisional prosthesis prepared for self-curing acrylic rebase with Elite Hard Relining (Zhermack spa, Badia Polesine, Rovigo, Italy) with direct technique; the prosthetic body has been generously prepared to receive the retentive caps in the front and to offer some mechanical retention in the posterior area.


CP2 - Fig. 60-61: Filling the denture with the fluid resin Hard Elite Relining (Zhermack spa, Badia Polesine, Rovigo, Italy).



FOLLOWING IS THE SEQUENCE OF IMPLANT CLINICAL POSITIONING WITH DURAVIT 3P TECHNIQUE (B&B DENTAL SRL, S. PIETRO IN CASALE, BOLOGNA, ITALY) AND MAXILLARY SURGICAL IMPRESSIONS ON EQUATOR ABUTMENTS.



CP2 - Fig. 63, 64, 65, 66: Volumetric evaluation on the TC; it is essential to have an accurate anatomical pre-operative study in all complex implant clinical cases. The volumes can also be evaluated on a Stereolithography, which it is also possible to simulate the surgery.



CP2 - Fig. 67: Green manual mounter of the Duravit 3P implant (B&B Dental srl, S. Pietro in Casale, Bologna, Italy), that is useful to screw in the first threads of the implant.



CP2 - Fig. 69-70: As an alternative to the classic manual torque wrench this implant system has a "screwdriver" to manually complete the positioning of the implant.



CP2 - Fig. 68: Detail of the placement of the screw; at this point the green mounter is no longer effective and a different type of instrument is needed.



CP2 - Fig. 71-72: Comparison between the planned surgery and the clinical case; on the stereolitography the planned positions are not holes, but the red dots and lines; 6 Duravit 3P implants (B&B Dental srl, S. Pietro in Casale, Bologna, Italy).



CP2 - Fig. 73: Positioning of the Biologic Equator Abutment on Duravit 3P implant (B&B Dental srl, S. Pietro in Casale, Bologna, Italy). It will never be removed and can be used both for fixed (in this case) or an overdenture prosthesis.



CP2 - Fig. 74: Biologic Equator Abutment on implants.







CP2 - Fig. 78: Surgical impression with sterile and radiopaque PVS Elite Implant Heavy (Zhermack spa, Badia Polesine, Rovigo, Italy) on dried transfers. Compared to the lower jaw procedure in this case the flaps are sutured.



CP2 - Fig. 79: Detail of the material around the transfer (Elite Implant Medium -Zhermack spa, Badia Polesine, Rovigo, Italy).



CP2 - Fig. 80: Detail of the material around the transfer; in this case it was not necessary to splint the transfer with composite resin. Directly following, the tray full of impression material is positioned in the mouth.



CP2 - Fig. 81: Mono-phase, mono-material pick up impression with Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo, Italy); note the transfer screw through the utility blue wax.



CP2 - Fig. 82: Manual unscrewing of the Equator transfer long screw.



CP2 - Fig. 84: Detail of the six Equator pick-up transfers in the impression.



CP2 - Fig 83: Upper jaw mono-phase, mono-material pick up impression with Elite Implant Medium (Zhermack spa, Badia Polesine, Rovigo, Italy). Following is the sequence of conditioning material direct rebase of the Provisional removable complete denture after surgery with Elite Soft Relining (Zhermack spa, Badia Polesine, Rovigo, Italy).



CP2 - Fig. 85: The provisional denture was prepared with a recess to obtain the maximum thickness of the conditioning material in the maxillary anterior region. This will limit the transmission of occlusal loads to implants during the immediate postoperative period.



CP2 - Fig. 87-88: Use of Elite Relining Primer (Zhermack spa, Badia Polesine, Rovigo, Italy) on the internal surface of the provisional denture. Throughout the procedure the use of vinyl gloves is suggested.



CP2 - Fig. 86: Kit for direct relining with conditioning material Elite Soft Relining (Zhermack spa, Badia Polesine, Rovigo, Italy); the first step is the primer for the adhesion acrylic - PVS.





CP2 - Fig. 91: During the material extrusion the tip must remain inside the already placed material to avoid bubbles.



CP2 - Fig. 92: Application of the rebasing Elite Soft Relining (Zhermack spa, Badia Polesine, Rovigo, Italy).





CP2 - Fig. 94: Denture filled of rebasing material only in the area of the surgery; the prosthesis has to be immediately placed in the mouth for full function.



CP2 - Fig. 95: Elite Soft Relining Kit for refinement of the rebased denture (Zhermack spa, Badia Polesine, Rovigo, Italy).



CP2 - Fig. 96: Incision and removal of excess material from the edge of the prosthetic border.



CP2 - Fig. 97: Incision and removal of excess material from the edge of the prosthetic border.



CP2 - Fig. 98: Removal of the excess material is easy wherever the resin was not treated with the Primer.



CP2 - Fig. 99: Removal of excess material and definition of the edge of the prosthetic border.



CP2 - Fig. 100: Rebase with Elite Soft Relining (Zhermack spa, Badia Polesine, Rovigo, Italy). The light blue piece of impression material (Elite Implant) on the right proves that this rebase has been done immediately after the surgical impression described before.



CP2 - Fig. 101: Clinical situation at the end of the surgery.



CP2 - Fig. 102: Image after a few weeks of healing; the reduction of loading due to the resilient relining material, Elite Soft Relining (Zhermack spa, Badia Polesine, Rovigo, Italy), promotes a healthy healing of tissues where the patient has always used the prosthesis.



CP2 - Fig. 103-104: Direct transformation of the old prosthesis in total implant OVD anchored to the 6 Equator Abutments; this procedure is the same as described in CP2 Fig. 55-62.



CP2 - Fig. 105: Image 10 days after maxillary surgery; periorbital and nose labial hematoma; the patient, who suffers from liver disease, presented thrombocytopenia and coagulopathy and was treated in collaboration with hematology colleagues of the Legnago Hospital (Verona - Italy).



CP2 - Fig. 106, 107, 108: The complication of hematoma did not require any specific therapy and was resolved in 20 days, but thanks to the procedure of surgical impression we could, in the meantime, proceed with the prosthesis procedures as shown by the images.



CP2 - Fig. 109: Image of the lower arch and Equator Abutments that have never been removed.



CP2 - Fig. 110: Mandibular overdenture; manufactured by dental technician, Ivano Bortolini.



CP2 - Fig. 111: Mandibular overdenture; manufactured by dental technician, Ivano Bortolini.





CP2 - Fig. 113: Image of the upper arch and Equator Abutments that have never been removed.



CP2 - Fig. 114: Maxillary overdenture; manufactured by dental technician, Ivano Bortolini.



CP2 - Fig. 115: Maxillary overdenture; manufactured by dental technician, Ivano Bortolini.





CP2 - Fig. 117: Clinical image at the end of the rehabilitation, with both maxillary and mandibular overdentures in place.







Letter of the Patient to the Dentist at the end of treatment

Dear Prof. Bortolini,

Thank you.

You were able to kick out the ghost that was tormenting me. It was the cause of many of my problems!

At the beginning, I thought that it lived in my teeth, but I had them all pulled and it somehow remained. Then, I was convinced that it lived in my dentures, but it was still there when I took them out to go to bed. In fact, it was even worse - my ghost preferred the dark. It wouldn't let me sleep and it made me feel old and ugly. It had a great old time making me cry and scaring my friends and people that I met on the street making me have sad eyes, wrinkles and halitosis.

I thought that it lived in my knees and in my hands and that it caused me pain - but with an aspirin the pain went away and it stayed.

I then thought that it lived in my liver and I told myself: maybe it would go away with a transplant or maybe others would come along with a new liver.

It forced me into solitude and isolation from the world.

I was wrong.

My ghost was in my jaw, in the bones of my jaw.

You eradicated it with the implant drill.

Now I am free. My eyes are clearer and open; everyone tells me that I have beautiful teeth; I can eat anything (I am becoming a whale!); I sleep well and dream that I am once again a little girl, that I can fly and that I am chasing my dog in the grass. I also smell better and taste better - before I didn't.

I am incredibly happy and I now want to go out and do everything. I am in a hurry to do everything.

A heartfelt thank you for all of the patience that you had and for your expertise.

I am grateful to you.

GS

P.S. "Who knows if you have found other cases of ghosts like mine - that live in bones?"

Answer of the Dentist to the Patient

Dear Ms. GS.,

Thank you for your letter that I have read many times and that I will proudly save.

I am happy that you have once again found enthusiasm. Your healing process is great for me as well - I can guarantee it, even if I am not certain to be able to scientifically demonstrate your hypothesis, I believe that there are great merits as a result.

The human mind is certainly more capable of anything that we can imagine.

I started reading your letter thinking that I had calmed the ghost down, making it slip down into your prosthesis, or even better - having provided it with a "house". But, after reading closer, it must have left, evaporating and then taking over Dr. Natali's body - I have watched him closely and he seems like he has changed. He hasn't laughed for weeks and on the last test he gave, he flunked all of his students...I hope we can save him too!

You give me the great opportunity to exchange professional ideas:

Two weeks ago, teachers asked my son what his father does and he responded - "Dentures!"

Now he can say "Ghostbusters!"

Kind regards,

Sergio Bortolini

P.S. I have already bought all of the Ramachandran books: I want to know all of the ghosts!

I also kindly thank you for not using the words "miracle" or "exorcist" in your letter. It would have been embarrassing.

Chapter 11

Bibliography

Ut sementem feceris, ita meteres.... Cicerone

(As you sow, so shall reap)



SECTION 1 Bibliography

Acikalin A, Ucar Y, Akova T, Erbil M, Cavusoglu AB, Natali A. Potentiodynamic-polarization and electrochemicalimpedance study of cast and laser-sintered alloys. J Dent Res 89 (Spec Iss B): 215, 2010 (<u>www.dentalresearch.org</u>).

Andreiotelli M, Att W, Strub JR. Prosthodontic complications with implant overdentures: a systematic literature review. Int J Prosthodont. 2010 May-Jun;23(3):195-203.

Assunção WG, Barão VA, Tabata LF, Gomes EA, Delben JA, dos Santos PH. Biomechanics studies in dentistry: bioengineering applied in oral implantology. J Craniofac Surg 2009; 20 (4): 1173-7. Baldissara P, Bortolini S, Papale G, Scotti R. [Heat-induced symptomatology in human teeth. An in-vitro study]. Minerva Stomatol 1998; 47 (9): 373-80.

Balmer S, Mericske-Stern R. [Implant-supported bridges in the edentulous jaw. Clinical aspects of a simple treatment concept]. Schweiz Monatsschr Zahnmed 2006; 116 (7): 728-39.

Bassi F, Carr AB, Chang TL, Estafanous E, Garrett NR, Happonen RP, Koka S, Laine J, Osswald M, Reintsema H, Rieger J, Roumanas E, Estafanous E, Salinas TJ, Stanford CM, Wolfaardt J. Clinical outcomes measures for assessment of longevity in the dental implant literature: ORONet approach. Int J Prosthodont 2013 Jul-Aug; 26 (4): 323-30.

Bassi F, Carr AB, Chang TL, Estafanous E, Garrett NR, Happonen RP, Koka S, Laine J, Osswald M, Reintsema H, Rieger J, Roumanas E, Estafanous E, Salinas TJ, Stanford CM, Wolfaardt J. Oral Rehabilitation Outcomes Network-ORONet. Int J Prosthodont 2013 Jul-Aug; 26 (4): 319-22.

Bassi F, Carr AB, Chang TL, Estafanous EW, Garrett NR, Happonen RP, Koka S, Laine J, Osswald M, Reintsema H, Rieger J, Roumanas E, Salinas TJ, Stanford CM, Wolfaardt J. Economic outcomes in prosthodontics. Int J Prosthodont 2013 Sep-Oct; 26 (5): 465-9.

Bassi F, Carr AB, Chang TL, Estafanous EW, Garrett NR, Happonen RP, Koka S, Laine J, Osswald M, Reintsema H, Rieger J, Roumanas E, Salinas TJ, Stanford CM, Wolfaardt J. Psychologic outcomes in implant prosthodontics. Int J Prosthodont 2013 Sep-Oct; 26 (5): 429-34.

Bassi F, Carr AB, Chang TL, Estafanous EW, Garrett NR, Happonen RP, Koka S, Laine J, Osswald M, Reintsema H, Rieger J, Roumanas E, Salinas TJ, Stanford CM, Wolfaardt J. Functional outcomes for clinical evaluation of implant restorations. Int J Prosthodont 2013 Sep-Oct; 26 (5): 411-8.

Berzaghi A, Denti L, Bassoli E, Natali A, Franchi M, Bortolini S, Consolo U. Comparative Mechanical Evaluation of Three Y-Tzp Formulations in FIVE Shades. J Dent Res 88 (Spec Iss A): 535, 2009 (www.dentalresearch.org).

Bortolini S, Berzaghi A, Martinolli A, Natali A, Lolli A, Consolo U. Dimensional stability of impression materials at different temperature: comparative study. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 3148 (www.dentalresearch.org).

Bortolini S, Berzaghi A, Martinolli M, Natali A, Franchi M and Consolo U. Procedures Simplification In Toronto Bridge Rehabilitations Using Equator Profile Rhein83. J Dent Res 91 (Spec Iss B): 856, 2012 (www.dentalresearch.org).

Bortolini S, Berzaghi A, Natali A, Consolo U. Evaluation of Patient's Satisfation Wearing Innovative Rhein83 Equator Implant OVD. J Dent Res 89 (Spec Iss B): 2873, 2010 (www.dentalresearch.org). Bortolini S, Berzaghi A, Natali A, Grilli L, Franchi M e Consolo U. Experimental Evaluation of Zirconia Roughness after 5 different Polishing methods. J Dent Res 87 (Spec Iss B): 2334, 2008 (www.dentalresearch.org).

Bortolini S, Berzaghi A, Natali A, Martinolli M, Nardi R, Consolo U. Implant Bridge Rehabilitations: Equator Profile Vs Multi Unit Abutment. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 1050 (www.dentalresearch.org).

Bortolini S, Berzaghi A, Natali A, Martinolli M, Paiardi M, Consolo U. Clinical efficacy of an implant impression material (Elite Implant) for immediate loading:case series. Eur J Oral Implantol 2013; 6(suppl): S61.

Bortolini S, Berzaghi A, Natali A, Martinolli M, Tarantino V, Consolo U. Toronto Bridge Rehabilitations: simplified procedures using a new universal abutbment. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 1049 (www.dentalresearch.org).

Bortolini S, Consolo U, Rossi R. Impronta in Implantoprotesi. Testo Atlante. Teamwork media editore. Brescia 2008, ISBN/ EAN: 9788889626047.

Bortolini S, Gatto A, Natali A, Ucar Y, Montin G, Bassoli E, Denti L, Consolo U, Iuliano L, Akova T. DMLS Dental Alloys vs Traditional Technique. J Dent Res 89 (Spec Iss B): 743, 2010 (www.dentalresearch.org). Bortolini S, Malaguti G, Natali A, Consolo U. The effects of disinfection operative procedures on the precision of irreversible Hydrocolloid impressions: a critical analisys of the literature. U & U - Journal of Dental University and Dental Industries Association - Reserarch and Italian Technology in Dental World, 2004, 3(Nov):36-41.

Bortolini S, Martinolli M, Berzaghi A, Natali A, Franchi M and Consolo U. Equator Profile Vs MUA In Toronto Bridge Rehabilitations: Comparative Evaluation. J Dent Res 91 (Spec Iss B): 857, 2012 (www.dentalresearch.org).

Bortolini S, Martinolli M, Natali A, Berzaghi A, Baldini A, Consolo U. Full-mouth rehabilitatio, a new immediate loading technique: Case report. Eur J Oral Implantol 2013;6(suppl):S56.

Bortolini S, Martinolli M, Natali A, Berzaghi A, Mansueti C, Serena V, Consolo U. Clinical Performance of Post-Extraction Wide Implants: Preliminary results. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 2054 (www.dentalresearch.org).

Bortolini S, Martinolli M, Natali A, Berzaghi A, Strozzi A, Baldini A, Consolo U. SEM Analysis of Sandblasted Double Acid Etched Titanium Implant. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 3739 (www.dentalresearch.org).

Bortolini S, Natali A, Berzaghi A and Consolo U. Prospective clinical evaluation of Rhein83 Equator Profile fixed implant

rehabilitations. J Dent Res 90 (Spec Iss A): 1062, 2011 (<u>www.dentalresearch.org</u>).

Bortolini S, Natali A, Berzaghi A, Martinolli M, Baldini A, Consolo U. Implant-retained removable partial dentures: a 10 year retrospective study. Part II: prosthetic complications and patient satisfaction. Eur J Oral Implantol 2013; 6(suppl): S63.

Bortolini S, Natali A, Berzaghi A, Martinolli M, Franchi M, Consolo U. Implant-retained removable partial dentures: a 10 year retrospective study. Part I: prosthetic success and implant survival. Eur J Oral Implantol 2013; 6(suppl): S62.

Bortolini S, Natali A, Berzaghi A, Vanini M, Nardi E and Consolo U. Fixed Implant Rehabilitation Passivated With Overdenture Attachments: Preliminary Results. Implantologia (Quintessenza ed.) 2011, 1:28-54, pag 44.

Bortolini S, Natali A, Bondioli F, Maziero Volpato CA, Fredel MC, Consolo U. Nanopowders of dental zirconia obtained by Pechini synthesis route. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 2395 (www.dentalresearch.org).

Bortolini S, Natali A, Ferrari J, Berzaghi A, Consolo U. Wear rate of the retention system of a two-implant-retained overdenture. J Dent Res 89 (Spec Iss B): 2874, 2010 (www.dentalresearch.org).

Bortolini S, Natali A, Franchi I, Malaguti G, Berzaghi A, Coppi C, Bianchi R, Grilli L, Franchi M e Consolo U. Implant re-

tained –RPD for Kennedy class I edentulism. J Dent Res 87 (Spec Iss B): 1708, 2008 (www.dentalresearch.org).

Bortolini S, Natali A, Franchi M, Coggiola A, Consolo U. Implant-retained removable partial dentures: an 8-year retrospective study. J Prosthodont 2011; 20 (3): 168-72.

Bortolini S, Natali A, Martinolli M, Berzaghi A, Zangara VR, Fabbroni G, Consolo U. GBR with Ultra-Thin Titanium Mesh and Coral-Derived Hydroxyapatite. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 3431 (www.dentalresearch.org).

Bortolini S, Natali A, Martinolli M, Berzaghi A, Ziveri L, Vellani V, Forabosco E, Consolo U. Transcrestal Sinus Floor Elevation with Coral-Derived Hydroxyapatite: pilot study. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 3840 (www.dentalresearch.org).

Burawi G, Houston F, Byrne D, Claffey N. A comparison of the dimensional accuracy of the splinted and unsplinted impression techniques for the Bone-Lock implant system. J Prosthet Dent 1997; 77 (1): 68-75.

Choi JH, Lim YJ, Yim SH, Kim CW. Evaluation of the accuracy of implant-level impression techniques for internalconnection implant prostheses in parallel and divergent models. Int J Oral Maxillofac Implants 2007 Sep-Oct; 22 (5): 761-8. Coelho AL, Suzuki M, Dibart S, DA Silva N, Coelho PG. Crosssectional analysis of the implant-abutment interface. J Oral Rehabil 2007; 34 (7): 508-16.

Conrad HJ, Pesun IJ, DeLong R, Hodges JS. Accuracy of two impression techniques with angulated implants. J Prosthet Dent. 2007 Jun;97(6):349-56.

Coppi C, Paolinelli Devincenzi C, Bortolini S, Consolo U, Tiozzo R. A new generation of sterile and radiopaque impression materials: an in vitro cytotoxicity study. J Biomater Appl 2007; 22 (1): 83-95.

De Boever AL, Keersmaekers K, Vanmaele G, Kerschbaum T, Theuniers G, De Boever JA. Prosthetic complications in fixed endosseous implant-borne reconstructions after an observations period of at least 40 months. J Oral Rehabil 2006; 33 (11): 833-9.

del Río-Espínola A, Mendióroz M, Domingues-Montanari S, Pozo-Rosich P, Solé E, Fernández-Morales J, Fernández-Cadenas I, Montaner J. (febbraio 2009). CADASIL management or what to do when there is little one can do.. Expert Rev Neurother. 9: 197-210.

Del'Acqua MA, Arioli-Filho JN, Compagnoni MA, Mollo Fde A. Accuracy of impression and pouring techniques for an implant-supported prosthesis. Int J Oral Maxillofac Implants 2008 Mar-Apr; 23 (2): 226-36. do Nascimento C, Barbosa RE, Issa JP, Watanabe E, Ito IY, Albuquerque RF. Bacterial leakage along the implant-abutment interface of premachined or cast components. Int J Oral Maxillofac Surg 2008; 37 (2): 177-80.

Dziewulska D, Kwieciński H. (2008). CADASIL syndrome cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy. Neurol Neurochir Pol. . 42: 123-30.

Ekfeld A, Zellmer M, Carlsson G. Treatment with implant supported fixed dental protheses in patients with congenital and acquired neurologic disabilities. A prospective study. Int J Prosthod 2013;33:517-24.

Ekfeld A: Early experience of implant supported prostheses in patient with neurologic disabilities. int j prosthod 2005;18:132-8.

Eliasson A, Wennerberg A, Johansson A, Ortorp A, Jemt T. The precision of fit of milled titanium implant frameworks (I-Bridge) in the edentulous jaw. Clin Implant Dent Relat Res 2010; 12 (2): 81-90.

Fenton A. The convenience of dental cantilevers. Int J Prosthodont 2009 Sep-Oct; 22 (5): 515-6.

Franchi I, Lolli A, Bianchi R, Bortolini S, Consolo U. Professional clinical bleaching with Pola Office: 6-month clinical results with spectrophotometric analysis. Minerva Stomatol 2007; 56 (4): 191-208. Franchi M, Mella R, Bortolini S, Calura G. [Hemostasis in patients at high hemorrhagic risk]. Minerva Stomatol 1995; 44 (5): 235-40.

Freud S. A General Introduction to Psychoanalysis. 1920, Horace Liveright Publisher New York, pag. 24-26.

Gonçalves TM, Campos CH, Gonçalves GM, de Moraes M, Rodrigues Garcia RC. Mastication improvement after partial implant-supported prosthesis use. J Dent Res 2013; 92 (12 Suppl): 189S-94S.

Gonçalves TM, Campos CH, Rodrigues Garcia RC. Implant retention and support for distal extension partial removable dental prostheses: Satisfaction outcomes. J Prosthet Dent 2014.

Gonçalves TM, Vilanova LS, Gonçalves LM, Rodrigues Garcia RC. Effect of complete and partial removable dentures on chewing movements. J Oral Rehabil 2013.

Greenstein G, Tarnow D. The mental foramen and nerve: clinical and anatomical factors related to dental implant placement: a literature review. J Periodontol 2006; 77 (12): 1933-43.

Gurbuz G, Ucar Y, Akova T and Natali A. Fracture Surface Characteristics of Laser-Sintered Co-Cr Alloys vs. Cast Alloys. Journal of Dental Research, Vol. 92 (2013), Special Issue A, 2352 (www.dentalresearch.org).

Gurbuz G, Ucar Y, Akova T and Natali A. Microstructure and Elemental Composition Characterization of Laser-Sintered

CoCr Dental Alloy. J Dent Res 91 (Spec Iss B): 3248, 2012 (www.dentalresearch.org).

Hegde R, Lemons JE, Broome JC, McCracken MS. Validation of strain gauges as a method of measuring precision of fit of implant bars. Implant Dent 2009; 18 (2): 151-61.

Hjalmarsson L, Örtorp A, Smedberg JI, Jemt T. Precision of fit to implants: a comparison of Cresco[™] and Procera® implant bridge frameworks. Clin Implant Dent Relat Res 2010; 12 (4): 271-80.

Hoyos A, Soderholm KJ. "Influence of tray rigidity and impression technique on accuracy of polyvinyl siloxane impressions". Int J Prosthodont 2011 Jan-Feb; 24 (1): 49-54.

Jemt T, Rubenstein JE, Carlsson L, Lang BR. Measuring fit at the implant prosthodontic interface. J Prosthet Dent 1996; 75 (3): 314-25.

John J. Sharry, Complete Denture Prosthodontics, McGraw-Hill Education, New York, 1968.

Johnson, Dean L; Stratton, Russell J. Fundamentals of removable prosthodontics. Chicago, Quintessence Pub. Co 1980.

Joutel A, François A, Chabriat H, Vahedi K, Andreux F, Domenga V, Cecillon M, Maciazek J, Bousser MG, Tournier-Lasserve E. (2000). CADASIL: genetics and physiopathology. Bull Acad Natl Med. 184: 1535-42. Kano SC, Binon P, Bonfante G, Curtis DA. Effect of casting procedures on screw loosening in UCLA-type abutments. J Prosthodont 2006 Mar-Apr; 15 (2): 77-81.

Malaguti G, Bortolini S, Franchi I, Natali A, Consolo U. Protocol for Making Implant Supported Screw Retained Prosthetic Superstructure. Spectrum Dialogue, June/July 2009 vol8, n6, 13-23.

Malaguti G, Denti L, Bassoli E, Franchi I, Bortolini S, Gatto A. Dimensional tolerances and assembly accuracy of dental implants and machined versus cast-on abutments. Clin Implant Dent Relat Res 2011; 13 (2): 134-40.

Malaguti G, Manicardi A, Natali A, Bortolini S, Consolo U. Psychological and Clinical impact of a social implant dentisitry program: study protocol. Minerva Stomatologica – Volume 59 – Supplemento 1 al N.4 – Aprile 2010. Pag. 75.

Malaguti G, Natali A, Franchi I, Bortolini S, Consolo U. Computer Guided Implant placement with CAD/CAM Technology and Immediate Loading: use of mini-implants as fixed intraoral reference points. A case report. Minerva Stomatologica – Volume 59 – Supplemento 1 al N.4 – Aprile 2010. Pag. 76.

Mendonça G, Fernandes Neto AJ, Neves FD. A customized guide for transferring angled abutments. J Prosthet Dent 2002; 87 (6): 698-9.

Mitha T, Owen CP, Howes DG. The three-dimensional casting distortion of five implant-supported frameworks. Int J Prosthodont 2009 May-Jun; 22 (3): 248-50.

Natali A, Bassoli E, Denti L, Berzaghi A, Franchi M, Bortolini S, Consolo U. Cast versus Laser-Sintered Cr-Co alloys: Study on mechanical characteristics. J Dent Res 88 (Spec Iss A): 1086, 2009 (www.dentalresearch.org).

Natali A, Bortolini S, Berzaghi A, Benatti D, Ucar Y. In Vivo Performance Of DMLS Co-Cr FPDs: 1 Year Follow-up. J Dent Res 91 (Spec Iss B): 160, 2012 (<u>www.dentalresearch.org</u>).

Natali A, Bortolini S, Montin G, Gatto A, Iuliano L, Bassoli E, Denti L, Ucar Y, Tolga A, Consolo U. Fracture Resistance analysis of Sintered and Casted Cobalt/Chromium Alloys. Minerva Stomatologica – Volume 59 – Supplemento 1 al N.4 – Aprile 2010. Pag. 118.

Natali A, Pirondi C, Bortolini S, Campioni E, Baldini A, Bertocchi E, Consolo U. FEM evaluation of different configurations of full-arch mandibular Implant prosthesis. J Dent Res 89 (Spec Iss B): 2880, 2010 (www.dentalresearch.org).

Natali A, Pirondi C, Bortolini S, Campioni E, Bertocchi E, Baldini A, Consolo U 3D-FEM Analysis of different configurations of Full-arch mandibular Implant prosthesis. Preliminary Reports. Minerva Stomatologica – Volume 59 – Supplemento 1 al N.4 – Aprile 2010. Pag. 459. Oderich E, Boff LL, Simon R, Cardoso AC, Magne P. Optimized placement of angled abutments for external-hex implant platforms: a pilot study. Int J Prosthodont. 2011 May-Jun;24(3):238-40.

Oderich E, Boff LL, Simon R, Cardoso AC, Magne P. Optimized placement of angled abutments for external-hex implant platforms: a pilot study. Int J Prosthodont 2011 May-Jun; 24 (3): 238-40.

Pow EH. A time-saving technique for selection, insertion, and provisional restoration of angulated abutments for dental implants. J Prosthet Dent 2005; 93 (4): 403.

Reyes S, Viswanathan A, Godin O, Dufouil C, Benisty S, Hernandez K, Kurtz A, Jouvent E, O'Sullivan M, Czernecki V, Bousser MG, Dichgans M, Chabriat H. (2009). Apathy: a major symptom in CADASIL. Neurology. 10: 905-10.

Schneider AL, Kurtzman GM. Restoration of divergent freestanding implants in the maxilla. J Oral Implantol 2002; 28 (3): 113-6.

Sethi A, Kaus T, Sochor P, Axmann-Krcmar D, Chanavaz M. Evolution of the concept of angulated abutments in implant dentistry: 14-year clinical data. Implant Dent 2002; 11 (1): 41-51.

van Kampen F, Cune M, van der Bilt A, Bosman F. Retention and postinsertion maintenance of bar-clip, ball and magnet attachments in mandibular implant overdenture treatment: an in vivo comparison after 3 months of function. Clin Oral Implants Res. 2003 Dec;14(6): 720-6.

Vigolo P, Fonzi F, Majzoub Z, Cordioli G. Evaluation of goldmachined UCLA-type abutments and CAD/CAM titanium abutments with hexagonal external connection and with internal connection. Int J Oral Maxillofac Implants 2008 Mar-Apr; 23 (2): 247-52.

Wenz HJ, Hertrampf K. Accuracy of impressions and casts using different implant impression techniques in a multiimplant system with an internal hex connection. Int J Oral Maxillofac Implants 2008 Jan-Feb; 23 (1): 39-47.

Wöstmann B, Rehmann P, Balkenhol M. Influence of impression technique and material on the accuracy of multiple implant impressions. Int J Prosthodont. 2008 Jul-Aug;21(4):299-301.

SECTION 2

Invitation to readers

The development of the prototypes was carried out thanks to the laboratories of the University of Modena and Reggio Emilia, the University of Ferrara and the Center for Research and Development of the Rhein 83. Even private dental practices selected by us have collaborated in the clinical trial.

Nevertheless, these case series have been created from intuition and clinical common sense and need to be further researched in order to be scientifically classified.

The authors are open on any comment and favor to make modifications to protocols proposed if passed by best practices in terms of effectiveness and clinical efficiency.

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