

MACIEJ ŻAROW

Co-authors:
WALTER DEVOTO
LOUIS HARDAN
MARGARIDA HENRIQUE
MARCO NICASTRO
DANIELE RONDONI

VENEERS



 QUINTESSENCE PUBLISHING

FANTASY RISK SUCCESS

MACIEJ ŻAROW

Co-authors:

WALTER DEVOTO

LOUIS HARDAN

MARGARIDA HENRIQUE

MARCO NICASTRO

DANIELE RONDONI



VENEERS

FANTASY RISK SUCCESSES



 QUINTESSENCE PUBLISHING

Berlin | Chicago | Tokyo

Barcelona | London | Milan | Mexico City | Paris | Prague | Seoul | Warsaw

Beijing | Istanbul | Sao Paulo | Zagreb



One book, one tree: In support of reforestation worldwide and to address the climate crisis, for every book sold Quintessence Publishing will plant a tree (<https://onetreepanted.org/>).



A CIP record for this book is available from the British Library.

 **QUINTESSENCE PUBLISHING**
DEUTSCHLAND

Quintessenz Verlags-GmbH
Ifenpfad 2–4
12107 Berlin
Germany
www.quintessence-publishing.com

Quintessence Publishing Co Ltd
Grafton Road, New Malden
Surrey KT3 3AB
United Kingdom
www.quintessence-publishing.com

Copyright ©2023

Quintessenz Verlags-GmbH

All rights reserved. Reprinting and reproduction in any form of all or part of the book without the written consent of the publisher is prohibited.

Editor: Iwona Koziel, Anya Hastwell

Design: Janina Knap

Design, typesetting and layout: Janina Knap, Małgorzata Trębicka, Sabine Theuring

Drawings: Julia Gebel

Translation: Natalia Jakubowicz, Anthony Casey

ISBN 978-1-78698-116-5

Printed in Croatia



❁ "A goal without a plan is just ... a wish"
Antoine de Saint-Exupéry



I DEDICATE THIS BOOK
TO PROFESSOR ZBIGNIEW JAŃCZUK,
OUR TIRELESS MENTOR

ABOUT THE AUTHORS



Maciej ŻAROW

Professional profile

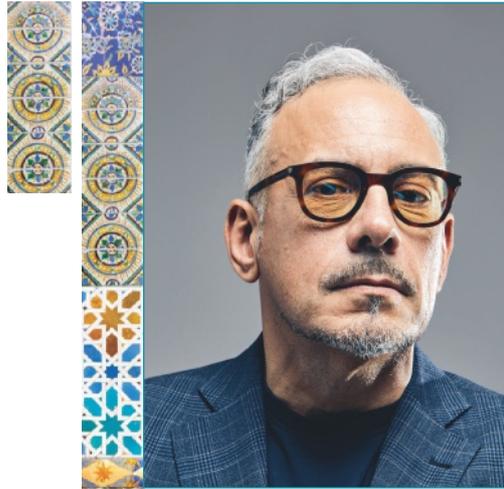
He received his dental degree from the Faculty of Dentistry at Semmelweis University, Budapest (Hungary). Upon his graduation, Maciej pursued a Doctor of Medical Sciences title, obtained after Pass with Honors for his dissertation defense on composite inlays-onlays in the restoration of endodontically treated teeth. Maciej has been a long-time researcher and lecturer, working with dental students at the Department of Propedeutics of Conservative Dentistry of CMUJ, Krakow. During his International Association of Dental Research scholarship, he conducted research work on adhesive bridges (FDPs) as well as the restoration of endodontically treated teeth at the universities of Leeds and Manchester. He has been a visiting professor at the University of Chieti (Italy), and visiting lecturer the UIC University (Barcelona). In 2021 he became a mentor at the prestigious Kois Center in Seattle. In 1999 Maciej established his private practice “Dentist” in Krakow and maintains it with his energetic attitude and everlasting passion.

Clinical practice

Maciej is an experienced clinician working with an extensive spectrum of practical approaches to dental treatment. He is keen on promoting and implementing new restorative techniques in his everyday practice. He furthermore favors initiating modern interdisciplinary procedures that harmonize esthetics with function and minimize interference with the natural mechanisms of functioning of the whole stomatognathic system. Maciej successfully carries out this philosophy in his private dental practice “Dentist” in Krakow, as well as in his Postgraduate Courses Center.

Professional activity

Maciej takes pride in being Editor-in-Chief of the *Quintessence for Dentists* journal. His book, *EndoProsthodontics: A Guide for Clinical Practice*, has achieved success and is now published in English, Chinese, Croatian, French, and Russian. He has authored more than 80 scientific papers in both national and international journals. Maciej is also an active member in the Italian restorative dentistry research group “Style Italiano,” as well as the Polish Academy of Esthetic Dentistry. In 2019 he became a certified member of European Society of Cosmetic Dentistry.



Walter DEVOTO

Professional profile

A graduate with honors from the Faculty of Dentistry and Prosthodontics at the University of Genoa (Italy), Walter's postgraduate studies are in the field of dental prosthetics. Initiator and participant of university research programs. University lecturer at medical schools in Madrid and Siena.

Clinical practice

Runs private practices specializing in esthetic dentistry and dental surgery in Sestri Levante and Portofino (Italy). He cooperates clinically with prestigious centers of esthetic dentistry around the world. Visiting professor at the Université de la Méditerranée in Marseille (France).

Professional activity

Member of the European Academy of Esthetic Dentistry – a founding member of its counterpart in Italy. Founder of the Style Italiano research group. An innovator of instrument technology and methods in the field of esthetics with composite material. Renowned lecturer at national and international congresses, author and co-author of books, including *Le Guide Estetique*, *Odontoiatria Restaurativa*, *Traumatologia Oral*, and *Layers*.



Margarida HENRIQUE

Professional profile

A dentist by choice and a graduate of the Medical University of Porto (Portugal), a few years later becoming a Master of Implantology at the University of Seville (Spain). There, she completed postgraduate studies in the field of esthetic dentistry.

Clinical practice

Runs a private dental clinic specializing in surgical and prosthetic treatment. She improves her knowledge and gains new experiences as a participant of renowned courses and congresses in prestigious dental training centers. She has unique knowledge in the field of tooth morphology, so necessary to optimize the esthetics and function.

Professional activity

Since 2019, she has actively participated in the activities of the Style Italiano group.



Louis HARDAN

Professional profile

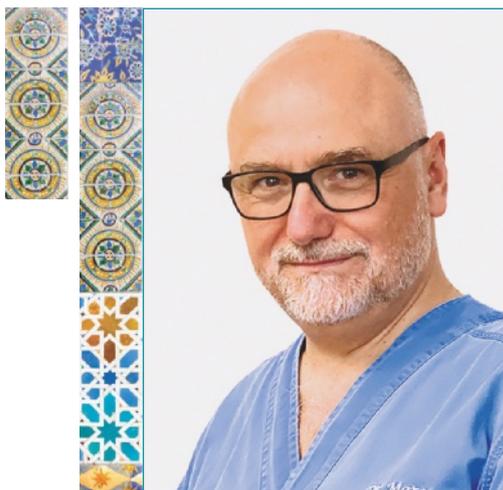
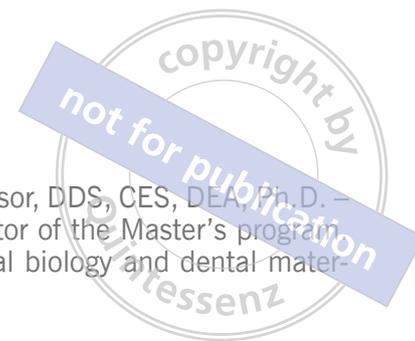
A graduate of the Saint Joseph University of Beirut-Lebanon. Full Professor, DDS, CES, DEA, Ph.D. – and former head of the restorative and esthetic department and director of the Master's program. He graduated in dentistry in 1989 and was awarded his Ph.D. in oral biology and dental materials in 2009.

Clinical practice

Owns a private practice in his hometown Byblos (Lebanon), dealing with esthetic dentistry. Inventor of Mobile Dental Photography systems for anterior and posterior documentation and optimizing dentist's communication with the dental laboratory.

Professional activity

Member of the Lebanese Dental Society – former general secretary of this organization. Scientific Director and Honorary Member of Style Italiano. Renowned congress lecturer, author of numerous publications in international specialist journals and author of the book: *Protocols for Mobile Dental Photography with Auxiliary Lighting* (Quintessence Publishing, 2020).



Marco NICASTRO

Professional profile

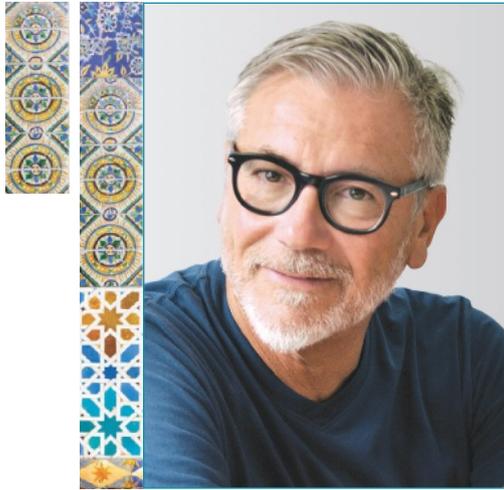
A graduate of the Faculty of Dentistry and Prosthodontics at the University of La Sapienza in Rome (Italy). He also completed studies in the field of prosthetics. He gained new experience in prosthetic procedures at Oral Design Center Roma, and in the field of new directions of esthetic dentistry by participating in courses conducted at the University of Geneva (Switzerland).

Clinical practice

His practice "Studio Dr. Nicastro" in Rome uses modern therapeutic methods. Minimally invasive procedures, shaping optimal occlusive conditions, integrating esthetics and functions, and finally, the methodology of digital dentistry set the tone for everyday practice in this therapeutic center. This renowned center is dominated by two specialties: esthetic dentistry and implantology, with a wide range of accompanying prosthetic procedures.

Professional activity

Member of the Italian Dental Society and the Italian Academy of Dental Prosthetics, and one of the founders of the Interdisciplinary CAD/CAM Study. Author of many international publications, lecturer at national and international congresses in the field of esthetic restorative dentistry.



Daniele RONDONI

Professional profile

Master of Dental Technology. A graduate of the renowned P. Caslini Dental School in Genoa (Italy). Lecturer and co-founder of Dental Technician School in Savona (Italy). He gained professional experience in leading centers for dental technicians in Switzerland, Germany, and Japan. Visiting professor at the University of Chieti-Pescara.

Clinical practice

Since 1982, he has been running his own dental laboratory. By devoting himself to an in-depth analysis of dental morphology and creating optimal esthetics in restorative dentistry, he has gained a reputation as a respected authority in the world of modern dentistry. He is the creator of original protocols of performing indirect composite techniques on metal structures and restorations on implants, known as the Inverted Hardness Layering System.

Professional activity

Member of the European and Italian Academy of Esthetic Dentistry. Persistently participates in the activities of Style Italiano. Author of the book *Ceramic Multilayering Technique* and co-author of the book *Conservative Restoration of Anterior Teeth*. He lectures on numerous educational projects and as a key lecturer at international congresses.



FOREWORD

I have known Dr. Maciej Żarow as a consummate student, gifted practitioner, and provocative thinker. He also is an excellent writer who answers complex clinical questions with clarity and simplicity.

I am honored to recommend his newest book, *Veneers*. Dr. Żarow's combined teaching, research, and clinical expertise are evident in the book's content. As you read, you will be exposed to new ways of thinking about veneers. The book begins with consideration of the "why" of veneer placement. Then, he carefully describes in detail the systems and proven methodologies that will allow the reader to achieve predictable, excellent outcomes. His treatment planning process includes a functional risk assessment to better ensure the long-term survival of the veneers. He also provides in-depth selection criteria for porcelain vs composite material choices. Other chapters include dental morphology, photographic communication, tooth preparation, provisional fabrication, and cementation.

I am certain this book will help any dentist fabricate and deliver veneers with predictable outstanding outcomes using a practical workflow that can be incorporated into any dental practice.

*John C. Kois DMD MSD
The Kois Center, Founder and Director
University of Washington School of Dentistry,
Affiliate Professor, Graduate Restorative Program
The Compendium of Continuing Education in Dentistry,
Co-Editor-in-Chief*

PREFACE

It is a great honor to introduce a book for my good friend Maciej Żarow. Maciej is passionate about life, a passion manifested in everything he does: in personal relationships, in travel, in fun, in treating patients, in teaching ... Over the years, he has been able to forge bonds of friendship all over the world, and from humility, study, and work, he has developed a deep and solid knowledge of broad aspects of dentistry, which has made him a referent in conservative and esthetic dentistry worldwide.

In this book, he has managed to bring together a team of excellent dentists and technicians, as well as great friends, to show us a new vision of ceramic veneers, a classic treatment of renewed validity. It is not a book to impress, but a book to teach, where his deep knowledge of the foundations of dentistry is revealed. The need to carry out adequate diagnoses that consider functional aspects fundamental to achieving success in this compromised type of treatment is emphasized. Through detailed clinical cases, it shows us when they are indicated, when we have to avoid them, what risks lie in wait for us, how we have to prepare the teeth, what type of materials to use, how to proceed with cementation, and also shows us where the future of this type of treatment is going, with the incorporation of digital workflow.

This is an excellent book by an exceptional person, which should be a must for clinicians dedicated to esthetic restorative dentistry.

*Miguel Roig Cayón
President
Spanish Society of Prosthodontics and Esthetic Dentistry
Professor and Head
Department of Restorative Dentistry
Universitat Internacional de Catalunya
Barcelona, Spain*



INTRODUCTION



Is veneering a challenge? What do you need to have a predictable key to success in your workshop? What did I have to learn and remember well, after an era of uncertainty, trials, and material choices to treat this therapy as an ordinary but demanding clinical procedure?

For 20 years, I have been offering my patients porcelain and composite veneers, and – more precisely – comprehensive esthetic treatment, in which the beauty and harmony of the anterior teeth put life in first place. I have come across dozens of cases of varying degrees of difficulty. Do I know enough about this micropart of modern dentistry today to authoritatively face every challenge that nature can give us? Probably not – although already in the hundreds of clinical situations that I have encountered over many years of practice, I find an extensive set of experiences, regularities, and rules that allow me to search for effective treatment procedures. And that is what I wanted to share in the pages of this book.

To make the book even more comprehensive and valuable, I invited my dear friends and eminent dentists to contribute. They are: Dr. Marco Nicastro, Dr. Walter Devoto, Prof. Louis Hardan, Dr. Margarida Henrique, and dental technician Daniele Rondoni. The first has been my mentor of esthetic dentistry for 20 years; the second is a long-standing motivator

Ceramic tiles “azulejos”! I have always been fascinated by the facades of Andalusian and Portuguese cities. The experts in their fabrication and “gluing” did it well enough that they could survive for hundreds of years. They have been my inspiration when planning porcelain veneers...

in the constant search for newer and simpler treatment methods; and the third is an innovator in dental photography. Margarida, on the other hand, is an absolute “freak” when it comes to her passion for her field – which made me consider that her extraordinary knowledge about the details of teeth would be a great enrichment of the knowledge contained in this book. The artist of the sketches is Dr. Julia Gebel, whom I would like to thank for her commitment and the countless number of drawings made. I must thank Dr. John Kois from Seattle – my teacher and mentor – who had put together my knowledge about functional risk assessment in esthetic cases.

In addition, I must acknowledge two outstanding Polish professors. The first is Prof. Stanisław Suliborski, whose lecture in 1995 and passion for veneers inspired me to become involved in this field, and the second is Prof. Jerzy Krupiński, my great teacher and friend. He had endless patience in teaching me how to logically put my thoughts on paper. I hope that all the students, novice dentists, and experienced practitioners who read this book will find many useful tips for their practice.

*Maciej Żarow
Cracow, Poland 2021*

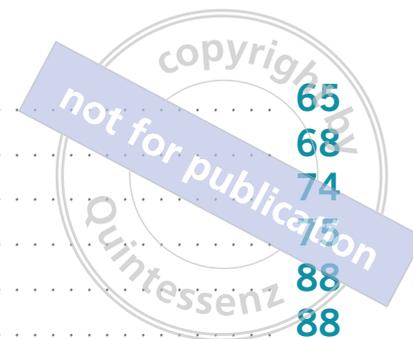


CONTENTS

CHAPTER 1 WHY VENEERS?	1
Questions the patient may ask	4
CHAPTER 2 PORCELAIN VENEERS – YES or NO?	17
Porcelain veneers – why yes?	17
Advantages of veneers from a clinical perspective	19
Porcelain veneers – why no?	29
Absolute contraindications	29
Relative contraindications	35
CHAPTER 3 PLANNING VENEERS	41
Medical history	44
Clinical examination	44
Structural risk factors	44
Functional risk factors	49
Photographic documentation	52
Creating a diagnostic wax-up	57
Dental office – dental laboratory communication card	58
Mock-up or test drive veneers	60



 CHAPTER 4 DENTAL MORPHOLOGY	65
Tooth structure	68
Dental morphology	74
The function of incisors and canines	85
Primary anatomy	88
Secondary anatomy	88
Tertiary anatomy	90
Teeth position and gingival architecture – esthetic considerations	91
 CHAPTER 5 PHOTOGRAPHY COMMUNICATION	101
Photography: diagnostic and training importance	103
Photography: dentist’s communication with the dental technician	104
Photography: communication with the patient	107
 CHAPTER 6 PREPARATION – IMPRESSION – PROVISIONAL VENEERS	111
Starting the preparation	113
The veneers drive-test (mock-up) before preparation	115
Ten steps for successful preparation	116
Final impression	123
Provisional veneers	125
Preparation dilemmas	128





CHAPTER 7 VENEERS CEMENTATION	137
Checklist	140
The most important stages of color verification	142
Veneer esthetic evaluation before cementation	144
Adhesive preparation of the veneers	147
Adhesive preparation of the tooth surface	150
Porcelain veneers cementation procedures	152
Procedures after veneers cementation	158
CHAPTER 8 ATLAS OF CLINICAL PROCEDURES	161
Veneers and teeth with multiple direct restorations	163
Veneers and discolored teeth after root canal treatment	172
Veneers and occlusal problems	185
Constricted chewing pattern	191
Occlusal dysfunction	206
Esthetics and function: A, B, C, D of restorative strategy	217
Veneers: changing the tooth shape	219
Veneers: diastema closure	228
No-prep veneers; partial veneers	237
Veneers: creating symmetry with the prosthetic crown	240
Veneers: creating symmetry with the implant-supported crown	244
Veneer replacement	248

 CHAPTER 9 MINIMALLY INVASIVE VENEERS OR NO-PREP VENEERS?	253
Preparation techniques	255
Choice of the ceramic material	262
No-prep veneers	270
 CHAPTER 10 COMPOSITE VENEERS	281
Tooth discoloration after root canal treatment and composite veneers	283
Simplified composite veneers performed with the Style Italiano technique	296
Indirect composite veneers	301
Other solutions for esthetic problems	312
 CHAPTER 10+ DIGITAL VENEERS	319
Porcelain veneers: a digital platform	321
Procedure protocol	322
 SUMMARY	331
Advantages of direct composite veneers	332
Advantages of indirect porcelain veneers	332
Parameters for selecting veneers	333
Video list	334



copyright by
not for publication
QuintessenZ

CHAPTER 3



PLANNING VENEERS

MACIEJ ŻAROW





There is one main rule:
without planning we cannot interfere
with the dentition!
Of course, we can replace the restoration,
but we cannot start veneer preparation
without planning.
Preparation of the teeth carries
a lot of responsibility for the dentist.
And it is IRREVERSIBLE!

Planning veneers

copyright by
not for publication
Quintessenz

When porcelain veneer preparation is performed, it is important to achieve an “equilibrium” between minimizing the preparation of the tooth structure (which will ensure maximum adhesion through the presence of enamel), achieving the necessary mechanical strength (appropriate thickness), and esthetics. This can be achieved through appropriate treatment planning.

ADHESION, MECHANICAL RESISTANCE, AND ESTHETICS

Planning the extension of veneer preparation is very important because their bonding to the tooth is purely adhesive, not retentive (Fig 3-1). If we prepare too little, the dental technicians will not have enough space for the restorative material, making them too convex, and the teeth will look like an off-road bumper or a locomotive from old times (Fig 3-2). To improve the shape, the dental technician would have to reduce the volume of the material from the labial surface, but this could also make the veneer too thin in some places and prone to cracking. However, if we prepare too much of the tooth, we will risk dentin exposure, which will weaken the veneer adhesion.¹⁻⁴

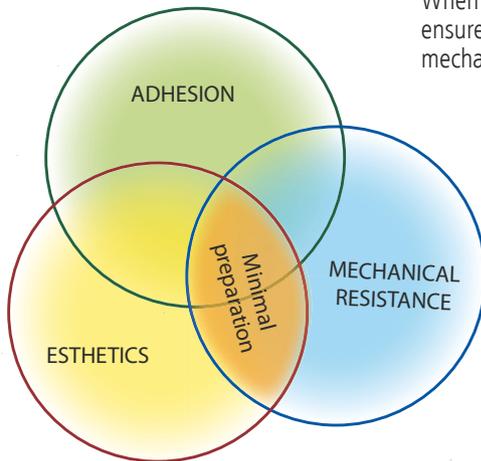
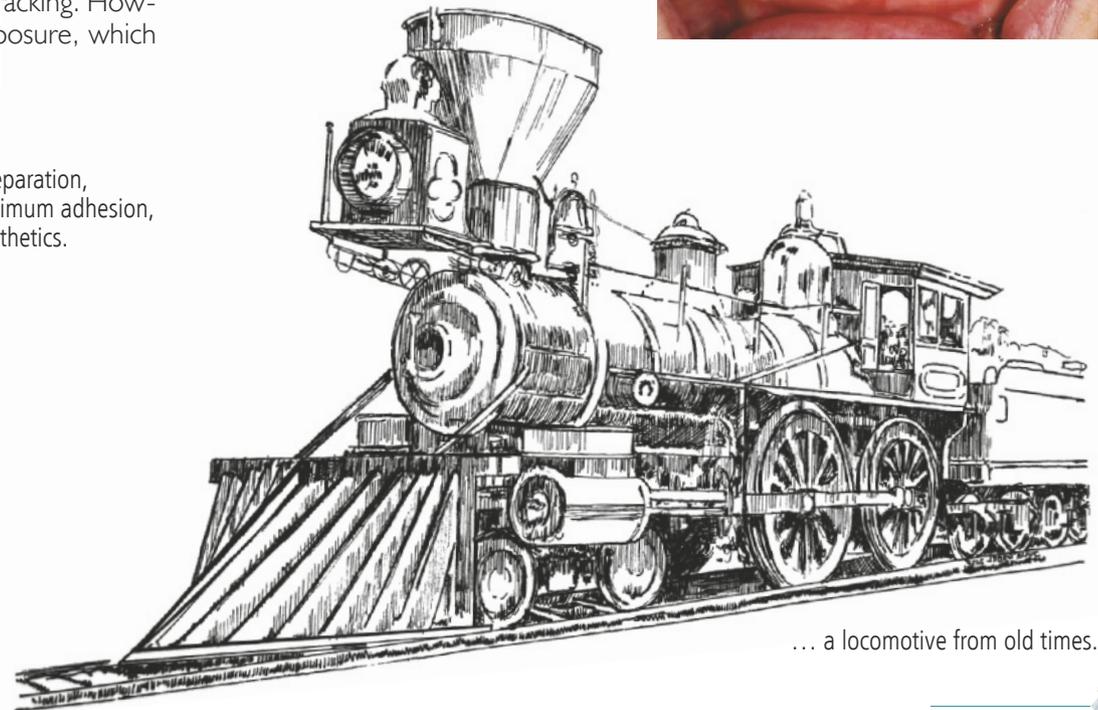


Fig 3-1

When carrying out veneer preparation, ensure the conditions for maximum adhesion, mechanical resistance, and esthetics.

Fig 3-2

A poorly planned and disastrously performed prosthetic restoration. The teeth are too big, have an unnatural shape and resemble...



... a locomotive from old times.

CONSULTATION VISIT

The consultation visit should include:

1. Thorough medical history
2. Clinical examination
3. Photographic documentation
4. Creating diagnostic wax-up

1. Thorough medical history

◆ Determining the needs, expectations, and risks related to the patient

First, you need to know the patient's general health. How did they find the dental office? Who (if anyone) recommended it to them? What is the patient's profession and their chief complaint? Are they satisfied with previous treatment? If not, why not? What expectations does the patient have of the initial visit? Answering these questions makes it possible to obtain information and create an initial patient profile (Fig 3-3).⁵⁻⁷



Fig 3-3

Favorable conditions for the first consultation: the right amount of time, a calm and quiet place allowing mutual trust to be established ... this seems crucial in the extremely intimate path toward creating a patient's smile. A short, hurried visit, the patient or dentist being late, disturbances, or unprofessional clinical staff members can ruin the first visit irreversibly.

A good solution is to present the patient with a questionnaire to be filled in during the first visit. This allows an assessment of the current condition of the oral cavity. The completed questionnaire is an excellent starting point for a clinical examination and treatment plan. Thanks to the information provided, the dentist does not have to take a scattergun approach to diagnosis that may make the patient uncomfortable. Rather, the dentist's observations from the clinical examination may relate to the patient's remarks in the questionnaire, which in turn can give the patient more confidence in the diagnosis.⁸

2. Clinical examination

◆ Structural risk related to the loss of hard tooth tissue

It is important to analyze the loss of tooth structure because the consequence of an unrecognized cause and lack of implementation of the prophylaxis/treatment may be a continuation of further hard tissues loss. This may have a negative impact on the long-term durability of restorative therapy, including veneers. The dentist/dental hygienist performing the dental examination should note any symptoms of tooth structure loss and ascertain their origin (Fig 3-4):

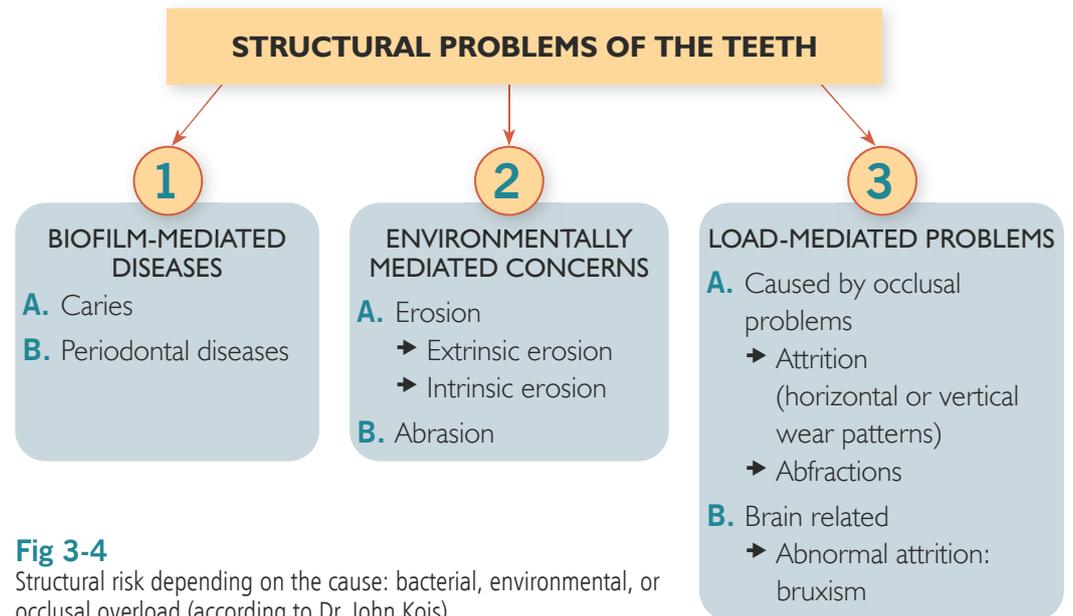


Fig 3-4

Structural risk depending on the cause: bacterial, environmental, or occlusal overload (according to Dr. John Kois).

- Structural loss related to biofilm-mediated diseases: caries result from a complex process of demineralization and remineralization of the enamel due to the exposure of organic acids produced by microorganisms living in the bacterial plaque.⁹
- Structural loss related to environmentally mediated concerns: erosion (hard tissue lesions caused by chemical processes, without cariogenic bacteria) (Fig 3-5) and abrasion (hard tissue lesions caused by physical wear by extraneous objects, such as hard bristle toothbrushes or excessively abrasive toothpaste; Fig 3-6).¹⁰⁻¹²

If the patient is diagnosed with erosion, the origin must be determined: intrinsic erosion (gastroesophageal reflux disease, bulimia) or extrinsic erosion (diet including lemons, grapefruits, fruit juices, energy drinks, etc.).



REMEMBER

The dental hygienist has a specific scope of procedures, such as recording and documenting (with photographs) the presence of cavities and identifying their origin – bacterial, chemical, or mechanical. The desire for white teeth makes patients buy toothpaste recommended in supermarkets or TV advertisements. These often have unfavorable abrasive properties, especially when the dentin is already exposed. The dental hygienist should monitor what kind of toothpaste is used by each patient.^{13,14}

The toothpaste abrasiveness ranked by recommended daily allowance (RDA) value:

- Low abrasive: RDA below 70
- Medium abrasive: RDA 70–100
- Highly abrasive: RDA 100–150

Fig 3-5a

Extrinsic erosion: a patient had a habit of consuming sauerkraut and pickled cucumbers every day. She was also fond of grapefruits and lemons. With a pH of around 2, these fruits represent a very high erosion risk factor.



Fig 3-5b

Intrinsic erosion: a patient suffered from an eating disorder (bulimia), which caused erosion on the palatal side of the maxillary incisors (typical for intrinsic erosions) and resulted in rapid tooth wear of the incisal edges.



Fig 3-6

Abrasion lesions on the buccal and cervical surfaces are related to many factors, such as hard-bristle toothbrushes, abrasive toothpaste, and a diet high in acids.



Table 3-1 Acidity of common beverages and foods

Beverage	pH range
Gatorade Orange	2.99
Clear American Tropical Fruit	3.07
Vitamin Water Zero Mega-C	3.05
S. Pellegrino Sparkling Natural Mineral Water	4.96
Perrier Carbonated Mineral Water	5.25
24:7 Energy Cherry Berry	2.61
180 Blue with Acai	2.82
Red Bull	3.43
Wine	2.3–3.8
Vinegar	2.4–3.4
Apples	2.9–3.5
Plums	2.8–4.6
Orange juice	2.8–4
Lemon juice	1.8–2.4
Raspberries	2.9–3.7
Mayonnaise	3.8–4
Coca-Cola	2.48
Pepsi-Cola	2.60

Source: Kois Center (Seattle, USA)

When extrinsic erosion is diagnosed, the focus should be on raising the patient's awareness of their diet and its impact on the loss of tooth substance (Tables 3-1 to 3-4).¹⁵

When intrinsic erosion is diagnosed, we usually refer the patient for gastroenterological consultation or multi-specialized behavioral therapy (in the case of bulimia nervosa).

When diagnosing abrasion, we think about the harmful effect of hard bristle toothbrushes or abrasive toothpastes, which wear away the tooth substance, especially exposed dentin (see Table 3-2), and we recommend those that are appropriate for this clinical situation.

Table 3-2 RDA value of certain products and toothpastes

Toothpaste	RDA value
Water	4
Sodium bicarbonate	7
Carifree CTx3 Gel	18.5
Enamel Plus	25
Rembrandt	53
Colgate Cavity Protection	65
Sensodyne Extra Whitening	104
Aquafresh Triple Protection	105
Amway Glister	110
Aquafresh All Tartar Control	110
Crest Pro-Health Whitening	168
Colgate 2-in-1 Whitening	200



Table 3-3 Enamel dissolution in mg/cm²

Beverage	pH	14-day weight loss(mg/cm ²)
Coca-Cola	2.48	2.78
Pepsi-Cola	2.60	3.07
Sprite	3.27	8.60
Canada Dry Ginger Ale	2.94	6.31
Mountain Dew	3.14	14.31
Diet Mountain Dew	3.17	14.82



Source: Kois Center (Seattle, USA)

Table 3-4 Main acids in common food products and beverages and their source

Acid	Food product and beverages
Acetic acid	Products containing wine vinegar, pickled cucumbers
Ascorbic acid	Vitamin C lozenges, some beverages
Carbonic acid	Fizzy drinks
Citric acid	Lemon and fruit juices
Malic acid	Apples and apple juices
Tartaric acid	Grapes, grape juices, wine
Phosphoric acid	Soft drinks (such as Coca-Cola)

Source: Kois Center (Seattle, USA)

- **Structural loss due to load-based mediated problems:** It is important to diagnose and record symptoms caused by occlusal loading, such as:

- **Attrition:** Mechanical wear resulting from mastication limited to contacting surfaces of opposing teeth (Fig 3-7).

In the patient's record, note the type of wear: whether it is horizontal or more vertical (typical "shelves of wear" are visible on the palatal surface of the maxillary incisors) and draw appropriate conclusions about this type of wear.^{16,17} It is also crucial to diagnose whether tooth wear is due to occlusal or neurological problems (such as bruxism; Fig 3-8). Suppose the patient has used an occlusal splint. In that case, it can be a useful tool to diagnose bruxism (patients diagnosed with bruxism usually leave characteristic transverse scratches on the splint, indicating nocturnal activity of the masticatory system).



Fig 3-7
Attrition: clear horizontal wear pattern is characteristic of occlusal dysfunction. The cause is usually the lack of bilateral simultaneous posterior occlusal support and a widened envelope of function leading to horizontal wear of the incisors. In this case, factors accelerating wear can include diet, too abrasive toothpaste with abrasive agents, or a hard-bristle toothbrush.



Fig 3-9
Abfractions: a 21-year-old patient, predisposed to clenching his teeth during the day, presented to the dental office with numerous non-carious cervical lesions in the premolars and anterior teeth. Many abfractions were rapidly deepened due to an acidic diet and improper tooth brushing.

- **Abfractions:** The pathologic loss of tooth substance in the cervical area can indicate premature contact on given teeth or other types of biomechanical loading forces, leading to cavities at the cemento-enamel junction (Fig 3-9). An acidic diet, incorrect toothbrush movement while brushing teeth, too hard-bristle toothbrushes, or abrasive toothpaste may deepen the abfraction.

- **Cracked tooth syndrome:** The lines of the fracture in the posterior teeth usually run between the marginal ridges of the contact surfaces, with pain while biting down or temperature change; this may indicate pathological occlusal activity that led to the cracked tooth (Fig 3-10). The remaining teeth should be inspected, the cause should be found, and a plan for preventive (occlusal splint) or therapeutic measures developed (for example, physiotherapy or changing occlusal conditions – analysis of premature contacts, etc.).



Fig 3-8
Bruxism: a 22-year-old patient, despite his young age, has worn out a large part of the enamel of the posterior teeth. This was caused by clenching his teeth at night combined with an acidic diet.



Fig 3-10
Cracked tooth syndrome: a patient who worked in a highly stressful profession (stockbroker) ground his teeth during the day and night. The results are numerous initial cracks in the enamel of the posterior teeth. Cracked tooth syndrome was detected in tooth 17. The patient presented with pain upon temperature change and while biting down. A lithium disilicate overlay and an occlusal splint therapy were proposed.



TIP

Recent studies define the following risk groups for non-carious cervical lesions:^{18,19}

- Group 1: Post-orthodontic patients (65% of patients under the age of 30)
- Group 2: Clenching habits – psychological effects of anxiety
- Group 3: Athletes – amateurs and professionals attending fitness clubs, gyms
- Group 4: GERD – gastroesophageal reflux disease and post-bariatric surgery patients
- Group 5: Drug users and/or illicit substances

◆ The risk of periodontal disease

The examination of the current periodontal condition, measurement of the depth of the sulcus or the periodontal pocket, and radiological evaluation of the alveolar ridge level are crucial for maintaining the teeth.^{20,21}

If there is periodontal disease, we start periodontal treatment or refer the patient to a periodontist. Even the presence of one gingival pocket with a depth greater than 5.5 mm places the patient in a high-risk group.²²

Regular visits combined with removal and plaque control and the patient's motivation are mandatory to prevent gum disease.²¹ Scientific research has confirmed that regular periodontal debridement carried out on patients between 20 and 30 years old reduces tooth loss after the age of 40.²¹



Fig 3-11

Fremitus is a symptom of occlusal overloading of a given tooth or group of teeth while closing in the centric relation or maximum intercuspation. The tooth vibration is felt when the index finger touches the tooth while closing the teeth.

◆ Functional risk

Functional risk assessment is an important step in the patient diagnosis before qualification for veneers, and inaccurate qualification may cause the rapid destruction of new reconstructions.^{23–28}

Porcelain veneers can be planned when:

- **There is no occlusal overload in the anterior teeth** (when the palpation test is done, the fingertips placed on the anterior teeth do not detect vibration, symptomatic of fremitus) (Fig 3-11)
- **There are no symptoms of tooth wear, or wear symptoms do not indicate an active, progressive process:** according to Dr. John Kois, significant progress has been made in this respect in the last five years, unlike the situation that once led to tooth wear but has now stopped – ie, adapted patient
- **There are no clear premature contacts** that would change the path of closure of mandible, leading to destruction/overloading/tooth wear
- **The patient does not report any pain or discomfort in the temporomandibular joints (TMJs). Basic examination of the joints includes:**
 - Examination of the vertical movement of the mandible – maximum opening (range of 35–60 mm)
 - Examination of the horizontal movement of the mandible (average range of motion 8–10 mm, ie, slightly more than the width of the maxillary central incisor)
 - Deviation during mandibular closure. The path of closure should be in a straight line. Use the facial midline as a reference to observe the course of deviation; the direction of the deviation goes toward the joint with the disorder
 - Muscle pain during palpation
 - Immobilization test: with the teeth held together, the patient tries to move the mandible in the horizontal direction (Fig 3-12a)

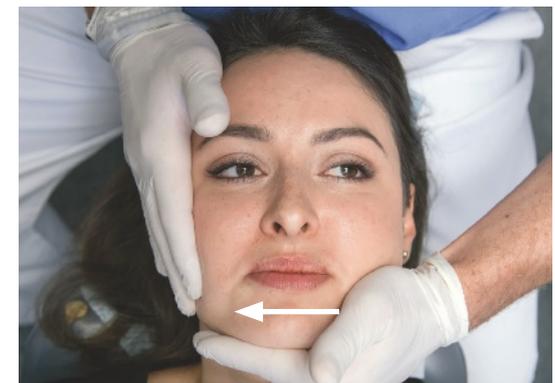


Fig 3-12a

Mandibular immobilization test: with the teeth held together, the patient tries to move the mandible in the horizontal direction against the hand of the dentist.

- TMJ sounds evaluation during mandibular opening
- TMJ loading test in centric and eccentric relation (Figs 3-12b and 3-12c)

Tenderness and pain during the test may also indicate disc displacement. The feeling of tension may suggest that the muscle contraction is persisting, which prevents the correct position of the condylar process in the mandibular fossa.²⁷⁻²⁹ In the case of a negative test, the pain symptoms are probably related to muscle problems – a Kois Deprogrammer is a good diagnostic and therapeutic tool.³⁰ When the tests are positive, the appropriate initial treatment is occlusal splint therapy with support on all teeth (Michigan splint), and the patient's TMJ should be monitored. If the symptoms persist, another therapeutic solution is a consultation with a physiotherapist or gnathologist. In the case of high functional risk, we will discuss the diagnosed problem with the patient and create a treatment plan that would allow veneers to be performed with reduced functional risk (Fig 3-13).



TIP

The TMJs should be capable of transferring heavy loads without tenderness, tension, or pain in centric relation. If the reaction in this case is positive, it means that the disc and complex process are not correctly aligned in the centric relation, and the joint should be examined more closely.



Fig 3-12b
The temporomandibular joint load test with lateral direction of force: the load force is directed on one of the TMJs, first the right and then the left (eccentric load test).



Fig 3-12c
The temporomandibular joint loading test is used to identify if we are dealing with a healthy TMJ. Place cotton rolls between the teeth in the posterior region, and then press the chin toward the TMJs (centric load test).

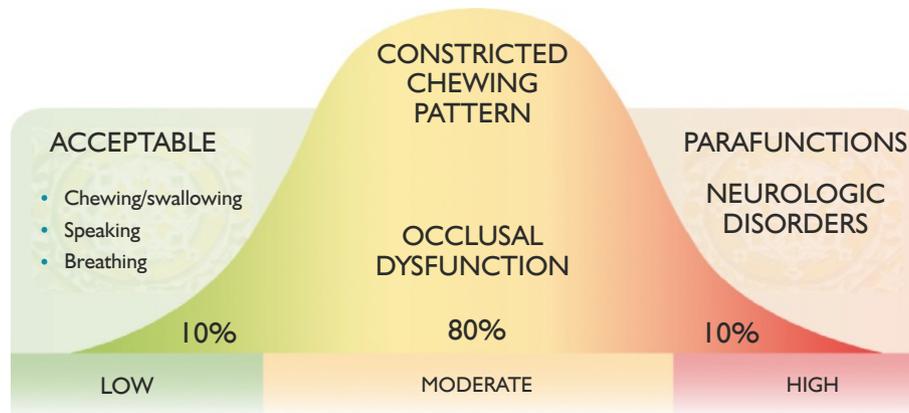


Fig 3-13
Functional risk assessment according to Dr. John Kois.

Esthetic risk

Esthetic risk assessment involves many factors that should be considered before deciding whether to cover anterior teeth with veneers.

- **Smile line:** Depending on the dynamics of the upper lip, the following can be distinguished:
 - High smile line (11% of the studied population)
 - Medium smile line (69% of the studied population)
 - Low smile line (20% of the studied population)³¹⁻³³

A high smile line reveals the gingiva and makes the border between the porcelain veneer and the tooth structure visible. The same problem exists in high smile line patients if the veneer does not cover any tooth discoloration (high esthetic risk).



copyright by
not for publication
Quintessen

- **Upper lip dynamic range when smiling** (Fig 3-14)³⁴⁻³⁵:
 - Medium: 8 mm (from rest position)
 - Minimum: <6 mm
 - Normal: 6–8 mm
 - Hypermobile: >10 mm
- The course of the midline: The course of the midline should be carefully analyzed before starting veneer treatment. The midline in the esthetic canons should run perpendicularly to the pupillary line and not deviate significantly from the facial midline (Fig 3-15a).³⁶ In the case of an oblique midline (Fig 3-15b), planning should include preparing the mesial proximal surfaces of the central incisors to enable the dental technician to correct them. If the biological loss of the tissues will be too great to correct the midline, orthodontic treatment should be considered. Therefore, the dentist should always evaluate the scope of the planned preparation.



Fig 3-14
Different range of the upper lip dynamic when smiling: from left – minimal, normal, and hypermobile (assuming that all subjects smiled maximally).



Fig 3-15a
The course of the midline is symmetrical and perpendicular to the pupillary line (face with drawn lines).

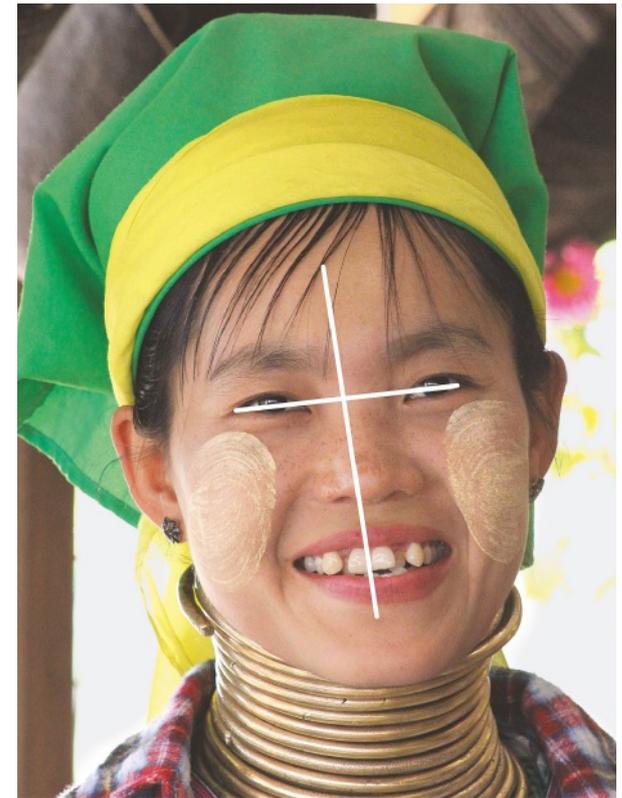


Fig 3-15b
Midline course: oblique to the pupillary line.

When the preparation could be too aggressive (significant exposure of the dentin, risk of losing pulp vitality), the dentist should think about an alternative plan (orthodontic treatment). It should be emphasized that porcelain veneers should not be an alternative treatment for teeth alignment if orthodontic therapy is required.

- **The shade of the tooth after veneer preparation:** Before the veneer preparation, it is necessary to (Fig 3-16):
 - Discuss any discoloration with the dental technician (is it possible to hide it?)
 - Consider the possibility of internal bleaching, which would avoid the use of an opaque material blocking the light transmission into the tooth
 - Whiten the neighboring teeth (it will make the work easier, as it is always simpler to make slightly brighter veneers)
 - Avoid dentin exposure during veneer preparation; in discolored teeth, the exposed dentin is even darker and more difficult to mask.



Fig 3-16

Discolored tooth vs veneer: when planning veneers on discolored teeth, the additional aspect of the dark dentin must be taken into account. If the dentin is exposed during the preparation, the discoloration will be even more difficult to mask. Discolored teeth 21 and 22 (a and b) with exposed dentin after preparation. We do not qualify this as a mistake, but we intend to avoid dentin exposure as much as possible.

3. Photographic documentation

Photographic documentation is an important stage of treatment planning, including porcelain veneers. It is the foundation for considering many treatment aspects and comparing the photographs with the diagnostic casts, even when the patient is no longer present in the dental office.

Such documentation is a starting point for treatment, which should also be included in medical history for legal reasons. The photographs provide a visual presentation of the problem to patients who may not be fully aware of their actual oral health condition.³⁷⁻⁴⁰

◆ **Photographs and communication with the patient and the dental laboratory. Photography is an excellent tool in dentist–patient–laboratory communication.** Providing the technician with a set of well-made photographs of the patient gives them a greater opportunity to select the perfect restoration color and give individual characteristics (fracture lines, discoloration, etc.), which will result in highly esthetic restorations, similar to natural dentition.

Thanks to digital photographs, the dental technician's work is not based only on casts, but they also gain important information about the symmetry of the face, the midline, the smile line, and the position of the teeth in relation to the lips in their rest position.

 **TIP**

With digital photographs, communication with the patient also becomes easier. Discussing the clinical situation with the patient based on photographic documentation allows not only for identification of the main oral cavity problems but also involves the patient actively in the entire treatment process.

There are several recognized protocols for performing circumferential supra-crestal fiberotomy (CFS), including the American Academy of Cosmetic Dentistry (AACD), such as Dr. Coachman's, used routinely in Digital Smile Design, and Dr. Kois', used at the Seattle Kois Center. These protocols are used in everyday practice depending on each dental clinic's need and profile. Aside from the main purpose of making digital documentation, each protocol has a distinguishing element.^{41,42}

The sequence of photographs suggested by the AACD is used to obtain accreditation. It includes 12 extraoral and intraoral photographs taken before and after treatment to show the results. Photographs are taken according to strictly defined parameters determined by the AACD.



The protocol proposed by Dr. Coachman allows detailed analysis of the teeth position in relation to the pupillary line and the symmetry of the face. Therefore, the most important photograph in this protocol is this one of the teeth with the use of buccal retractors, including the entire face of the patient. A characteristic element of this protocol is the photograph of the face from the 12 o'clock position, which is done while standing behind the patient with their head lying on the dentist's chair. Based on multiple photographs in this sequence, dental reconstruction is planned with a computer simulation, called Digital Smile Design (DSD).

Dr. John Kois, in his original sequence, pays special attention to the photograph of the lips in repose and the position of the canines in relation to the upper lip. The photograph that distinguishes this protocol is the shot of the profile showing the position of the anterior teeth in order to determine their position in relation to the lips (upper and lower).

As can be seen, the scope of work performed in a given dental practice is significant when choosing an effective method of photographic documentation. The sequence of photographs – proposed in the Dentist Educational Centre in Cracow/Poland for esthetic treatment planning – is shown in Table 3-5.

◆ Photographic documentation and planning of porcelain veneers

While taking the photographs, the composition of the maxillary teeth is analyzed. A photograph of the patient's lips in repose is a key element in planning^{41,42}: Whether to elongate the teeth? How much to elongate the teeth? Whether to elongate toward the incisal edge or the gingival margin?

Several of these photographs allow an assessment of the current length of the teeth in relation to the upper lip. How do the central incisors look? If they are hidden under the lip in the rest position, I would like to slightly elongate them to be more exposed from under the upper lip in repose. The younger the patient is, the greater the exposure of the maxillary incisors should be; the older the patient is, the less visible the exposure of the maxillary incisors should be.

The sex of the patient also matters because women tend to expose their teeth slightly more than men (Fig 3-17), and their central incisors are more dominant than their lateral incisors.

Fig 3-17

The exposure of the maxillary central incisors from under the upper lip in a rest position may vary depending on the patient's sex or age. Example of (a) major and (b) minor exposure of the central incisors from under the upper lip.



REMEMBER

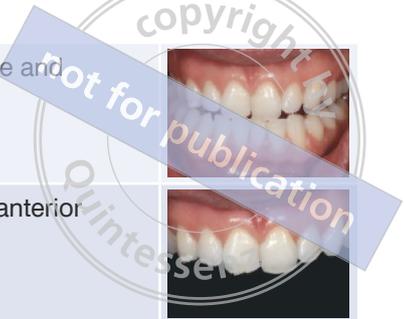
Performing the proper sequence of photographs and mock-up simulation, and then presenting these simulations to the patient in the form of a PowerPoint/Keynote presentation, provides:

- Motivation for the dentist and confirmation of whether the planned esthetics are a reasonable motivation for the dental assistant and other members of the dental team to include them in the “spiral of adrenaline” necessary in a modern, motivated dental office
- Motivation for the patient, who would like to see the final result of treatment

Table 3-5 Sequence of photographs taken during the patient's first visit³⁷

A. Extraoral photographs, the so-called portrait photography (f/8, 1:15, autofocus)				
	Projection	Description	Purpose of the photograph	Photograph
1	Minimal smile	<ul style="list-style-type: none"> Lips in repose; pupillary line parallel to the horizontal plane Plain background (for example, white, gray) Camera lens in the same plane as the patient's face Focus point: patient's eyes 	Determining the symmetry, shape, and proportions of the face	
2	Maximum smile	<ul style="list-style-type: none"> Patient's wide, natural smile 	Esthetic analysis of the smile	
3	Profile	<ul style="list-style-type: none"> Frankfurt (horizontal) plane, parallel to the floor Focus point: the patient's eyebrows 	Analysis of the Ricketts esthetic plane course and the nasolabial angle	
4	Face with retractors	<ul style="list-style-type: none"> Pupillary line symmetrical to the floor Midline perpendicular to the horizontal line 	Planning of the esthetics DSD analysis Communication with the dental technician (the dental technician analyzes the position of the teeth in relation to the face symmetry)	
B. Intraoral photographs and close-ups (f/20, 1: 3, M-focus)				
5	Lips in repose	<ul style="list-style-type: none"> "En face" projection The patient says, for example, the word "Emma" 	Analysis of the exposure of maxillary incisors from under the upper lip in repose (the norm of exposure of the maxillary incisors is 1–3 mm; may vary depending on sex, age, and individual factors)	
6	Maximum smile	<ul style="list-style-type: none"> "En face" projection Focus point: central incisors We try to take the patient's most natural smile 	Esthetic analysis of the smile – vertical and horizontal symmetry, the smile line course, assessment of the presence of anterior and lateral negative space, analysis of red esthetics (analysis of the esthetic risk)	
7	Position of maximum intercuspation	<ul style="list-style-type: none"> "En face" projection Use buccal/labial retractors Center point of the photography: proximal contact point of the central incisors Focus point: canines or first premolars 	Documentation of current occlusal conditions (in MIP)	



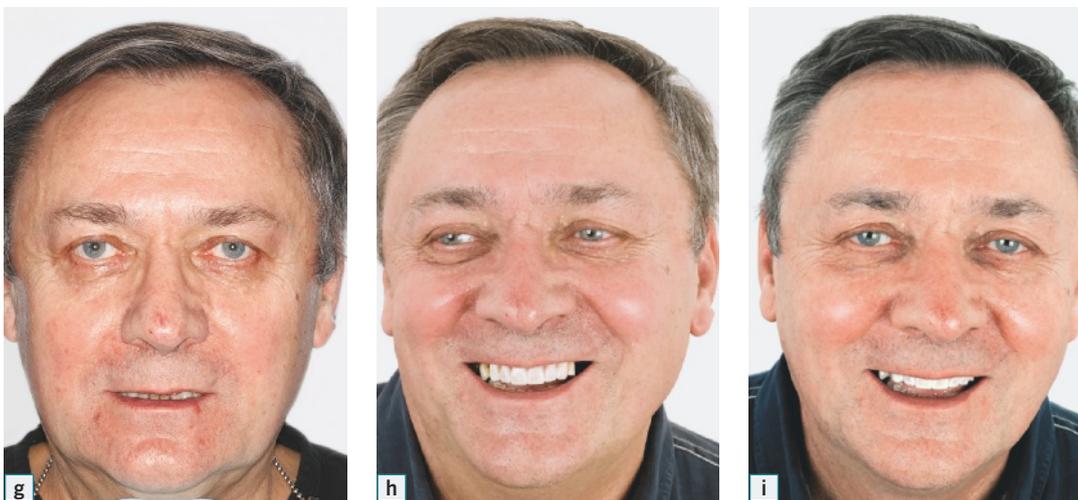


8	Edge to edge position	<ul style="list-style-type: none"> • Protrusive position of the patient's mandible • Contact is only on the incisal edges of the maxillary and mandibular central incisors 	Assessment of the anterior guidance and exposure of mandibular incisors	
9	Maxillary anteriors on a black background	<ul style="list-style-type: none"> • Use an anterior black contrastor 	Exposing the characteristics of the anterior maxillary teeth	
10/11	Buccal lateral right/left	<ul style="list-style-type: none"> • Use a buccal mirror and a buccal retractor at the opposite side to be photographed • Focus point: canines or first premolars 	Analysis of occlusal contacts in the lateral region, analysis of non-carious cervical lesions, for example, abfractions, abrasions, erosions	 
12	Occlusal-upper arch	<ul style="list-style-type: none"> • Use an occlusal mirror and labial retractors • Mirror is resting on the lower arch • Photography is taken at an angle of 45° to the mirror surface • Dentist takes a photograph while standing behind the prone patient in the supine position • Focus point: first premolars 	Documentation of the maxillary arch	
13	Occlusal-lower arch	<ul style="list-style-type: none"> • Use an occlusal mirror and labial retractors • Mirror is resting on the mandibular arch and retromolar trigone • Tongue lies freely on the floor of the mouth or rests on the palate 45° angle between the camera lens and the occlusal mirror surface • Dentist takes the photograph while standing in front of the prone patient in the supine position • Focus point: first premolars 	Documentation of the mandibular arch	
C. Additional photographs (f/10, 1: 3, M-focus)				
14	12 o'clock position	<ul style="list-style-type: none"> • Dentist takes a photograph while standing behind a prone patient • Photograph of a patient's natural smile 	Analysis of the maxillary incisors line in relation to the lower lip line, analysis of the midline course	



Figs 3-18a to 3-18c

Screenshots from a PowerPoint presentation showing DSD planning according to Dr. Coachman's protocol. (a) An "en face" photograph of the patient's face and (b) the face with the retractors. (c) Basic lines are drawn for esthetic planning: the pupillary line and the midline perpendicular to it.



Figs 3-18d to 3-18i

Screenshots from a PowerPoint presentation showing DSD planning according to Dr. Coachman's protocol. (d) The close-up of the teeth was "cut out" from the photograph with the retractors, thanks to which we can be sure that the horizontal line is aligned with the pupillary line. (e, f) Now, we draw up the planned new teeth outlines, which will be the basis of communication with the dental laboratory in order to prepare the initial esthetic wax-up. (h to i) Wax-up was transferred into the mouth using the silicone index and Protemp (mock-up). Thanks to the photographs obtained during the mock-up (ie, with provisional restorations), we can improve communication with the patient and the dental technician. We are also able to start functional planning of the case.



4. Creating a diagnostic wax-up

To create a proper diagnostic wax-up, it is essential to provide the dental laboratory with relevant information, such as:

- Length of the maxillary central incisors (in millimeters, average length: 10–10.5 mm)
- Description of the line course along the incisal edges of the maxillary incisors (dominance of the maxillary central incisors): Major dominance? Minor dominance?
- The proposition of the tooth shape: Rectangular? Oval? Triangular?
- General information about the patient: sex, age, profession, character traits

Transferring this information may take the form of a card, PowerPoint/Keynote presentation, ie, DSD by Dr. Coachman (Fig 3-18) or simple drawings, photographs, or printouts (see dental office – dental laboratory communication card).

◆ Taking impressions and facebow registration

Take an alginate impression of the mandibular and maxillary arches and a facebow registration to inform the dental technician about the horizontal plane based on

the pupillary line (Fig 3-19).^{43,44} Also, take a bite registration in the maximum intercuspation. If major occlusal changes are planned, the central relation should also be registered (see Chapter 8).

◆ Creating an esthetic wax-up

The technician mounts the casts in the articulator according to the facebow registration. Then, using all the information provided by the dentist in the form of photographs, notes, or DSD presentation, they start the esthetic waxing. The esthetic wax-up aims to create an initial esthetic treatment plan and test it with the patient (transferred to a mock-up). We do not analyze the function at this stage. Rather, it is about verifying the patient's expectations and confirming that the planned work makes esthetic and therapeutic sense.

The Kois Platform (Panadent Occlusal Platform) attached to the articulator can help the dental technician control the symmetry and the course of the horizontal plane, making the waxing process predictable. After creating the diagnostic wax-up, the dentist evaluates the esthetics on the casts (Fig 3-20). Only after the dentist's initial approval of the wax-up can the patient be invited for a "test drive," ie, transferring the wax-up to the oral cavity.^{45–48}



Figs 3-19a and 3-19b
Facebow registration.



Fig 3-20

The dentist should approve the diagnostic wax-up, assessing whether it has been prepared as recommended. The midline, symmetry, tooth shape, and inclination of the long axis of each tooth are all checked.



Dental office – dental laboratory communication card
 (DT Janos Mako, DDS, PhD Maciej Zarow, MD)

1. Date of request:
2. Patient's name and surname:
3. Patient's age:
4. Patient's sex:
5. Patient wishes:

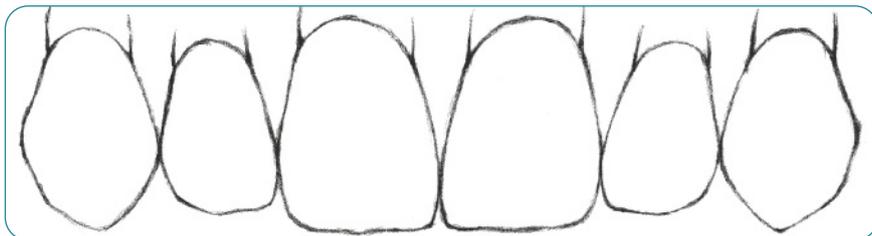
6. Supplementary materials available for the dental laboratory:

- a. Diagnostic wax-up?
- b. Alginate impression reflecting the treatment plan (of mock-up or initial situation)?
- c. Photographs of the initial situation?
- d. Mock-up photographs?
- e. "Historical" patient's photographs?

7. Description of the planned restoration:

8 - 7 - 6 - 5 - 4 - 3 - 2 - 1	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8
8 - 7 - 6 - 5 - 4 - 3 - 2 - 1	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8

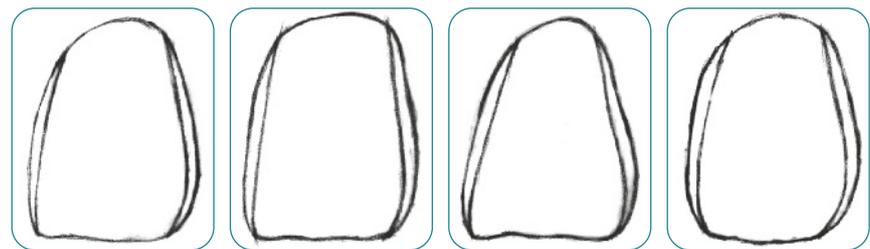
8. Shade of the performed restorations/color map:



9. Shade of the tooth after preparation (please draw):

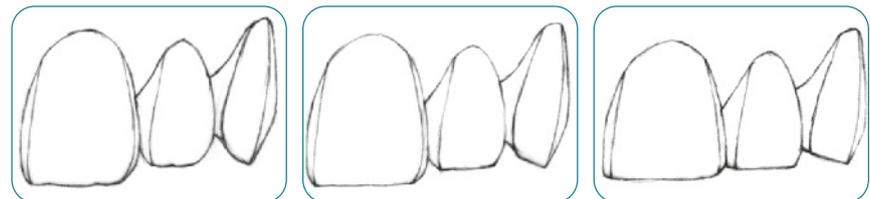


10. Primary tooth shape:



Standard Squared Triangular Oval

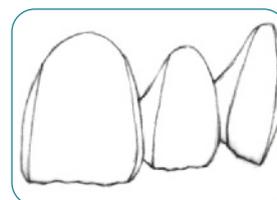
11. Degree of incisal edge tooth wear:



Youthful Slightly worn Very worn

12. Incisal edge characteristics:

- a. Wrinkled?
- b. Straight?





13. Characteristics of the tooth surface:

- a. Smooth?
- b. Medium marked?
- c. Clearly marked?
- d. Other? (please describe)

.....

.....

.....

14. Symmetry:

Are we trying to achieve symmetry on both sides:

- Yes:
- No:
- Freely:

If the symmetry deviates, how to make the restoration?

.....

.....

.....

15. Other information:

a. Length of the incisors (mark or write down the planned length of the teeth)

- Maxillary central incisors (mm):
..... 8.0 8.5 9.0 9.5 10.0 10.5 – 11.0 11.5

- Maxillary lateral incisors (mm):
..... 7.0 7.5 8.0 8.5 9.0 9.5 10.0

b. Level of domination of central incisors:

- Clearly dominant:
- Moderately dominant:
- Barely dominant:

c. Level of dominance/exposure of canines:

- Clearly dominant:
- Moderately dominant:
- Barely dominant:

d. Strongly arched incisor edges of the lateral incisors:

e. Color of the gingiva

.....

.....

f. Method of closing the interdental spaces/black triangles (determine the distance of the proximal contact point from the preparation margin in the interdental spaces)

- a. Gentle proximal contact point
- b. Medium-length proximal contact area
- c. Long proximal contact area

g. Other:

.....

.....

h. Other supplementary drawings (please draw):



Fig 3-21a

The silicone index is taken from an approved diagnostic wax-up.



Figs 3-21b and 3-21c

(b) Cut away the silicone excess with a straight handpiece carbide bur or with a surgical scalpel, which will facilitate the removal of resin excess during the mock-up. (c) Composite temporization material is applied to the silicone index.

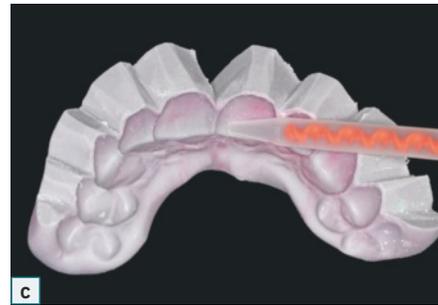


Fig 3-21d

Silicone index filled with the temporization material is transferred to the mouth ...



Fig 3-21e

... and after its initial setting, resin excess is removed from the adjusted proximal surfaces of the silicone index with the aid of a dental spatula.

MOCK-UP OR TEST-DRIVE VENEERS

Spending enough time to perform the test veneers is a critical step in communicating with the patient, understanding their expectations, and achieving mutual trust at the beginning of treatment planning.

Transferring the shape of the teeth from the wax-up is performed by means of a silicone index (Fig 3-21 a). The silicone excess is cut away with a surgical scalpel or a straight handpiece carbide bur (Fig 3-21 b), then a composite temporization material (Fig 3-21 c) (for example, Protemp) is applied to the index, which is transferred to the mouth (Fig 3-21 d). Next, wait for the initial setting of the resin and start removing excess material with a dental spatula.

After the composite resin has fully set (about 5 minutes), gently remove the silicone index and proceed with the removal of the excess material from the palatal side and the proximal surfaces (Fig 3-21 e).

At this stage, the author would give the patient a mirror and ask whether they liked the work. This is a mistake! The patient immediately brings the mirror closer and searches for inaccuracies that will certainly be visible at close range. While looking at the mock-up, the patient also asks many questions, such as: Will the veneers be connected as in the case of the mock-up? Will they have bumps near the gums? Will they be rough?



TIP

Instead of looking for the right answers to unfavorable questions, we take a series of photographs in an improvised photographic studio (with appropriate face lighting). Photographs must be taken in a relaxed atmosphere.



copyright by
not for publication
Quintessenz



Fig 3-22

A photographic studio allows us not only to take professional photographs of the patient's face and smile, which helps to plan proper treatment, but is also a part of building a relationship with the patients and recognizing their expectations.

Fig 3-23

Conversation in a quiet room and presentation of photographs and drawings illustrating the concept of planned treatment is a basic element of communication with the patient. Without communication skills, one may be an excellent professional but will not be a good dentist. These skills should be improved throughout life, for the benefit of the clinic and the patients.



The photography session can be a pleasure with some patients, while with others it can be a much more difficult task, depending on the nature and attitude of the person, and on the dentist's empathy (Fig 3-22).

The atmosphere created during the photography session is very important. A patient intimidated by a tense situation will look scared and not show their teeth with relaxed lips. On the contrary, a patient who is naturally smiling or even laughing will fully reveal the created mock-up, which will allow a rational assessment of the planned esthetic treatment.⁴⁹

Everyone probably has their own method of talking to the patient and relaxing the atmosphere; the method preferred by the author is to ask the patient to recall their most "cheerful" friend from college or high school and ask what their name was, or to recall a funny situation from the school times. Now, when a natural smile appears on the patient's face, you can start taking photographs. Then they are transferred to a computer and put into slides to be compared with the initial

photographs. It is reasonable to sit down with the patient in a place where no one will disturb you, and spend 15–20 minutes to unhurriedly discuss the esthetic plan and show the photographs before and after the mock-up (Fig 3-23).

The conversation with the use of photographic documentation and the result of this discussion, and the patient's response are decisive in undertaking the treatment by the dental team and for the patient's acceptance (Fig 3-24). Sometimes it is better to withdraw from the planned treatment if it is clear that there is no agreement, if the patient's expectations may not be met, or are not in line with our medical ethics (for example, if tooth preparation would not have a medical indication in a given case).

On the other hand, the patient must feel comfortable, convinced of the planned treatment, and confident that their dental team will perform this treatment in the proper way.⁵⁰

REMEMBER

Not every person who expects esthetic improvement has to become your patient. Sometimes, a dentist would give a lot to go back in time and decline to undertake treatment. The decision on a common path in the form of comprehensive treatment requires responsibility from the dentist and should only be made if they can meet the patient's expectations. When the dentist sees that the patient's expectations are not in line with the treatment plan, the therapy should not be started.



Fig 3-24

The dental technician's ability to get to know the patient before the treatment begins is important in building trust and understanding the patient's full expectations. Planning with wax-up and mock-up provides key information before starting laboratory work.

REFERENCES

- Hui K, Williams B, Davis EH, Holt RD. A comparative assessment of the strengths of porcelain veneers for incisor teeth dependent on their design characteristics. *British Dent J* 1991;17:51–55.
- Sheets CG, Taniguchi T. Advantages and limitations in the use of porcelain veneer restorations. *J Prosthet Dent* 1990;64:406–411.
- Peumans M, Van Meerbeek B, Lambrechts P, Vanherle G. Porcelain veneers: a review of the literature. *J Dent* 2000;28:163–177.
- Burke FJ. Survival rates for porcelain laminate veneers with special reference to the effect of preparation in dentin: a literature review. *J Esthet Restor Dent* 2012;24:257–265.
- Davis LG, Ashworth PD, Spriggs LS. Psychological effects of aesthetic dental treatment. *J Dent* 1998;26:547–554.
- Mizrahi B. Visualization before finalization: a predictable procedure for porcelain laminate veneers. *Pract Proced Aesthet Dent* 2005;17:513–566.
- Small BW. How communication can affect aesthetic outcome. *Pract Periodontics Aesthet Dent* 1992;4:11–15.
- Kois DE, Kois JC. Comprehensive risk-based diagnostically driven treatment planning: developing sequentially generated treatment. *Dent Clin North Am* 2015;59:593–608.
- Rechmann P, Kinsel R, Featherstone JDB. Integrating Caries Management by Risk Assessment (CAMBRA) and prevention strategies into the contemporary dental practice. *Compend Contin Educ Dent* 2018;39:226–234.
- O'Toole S, Bartlett D. The relationship between dentine hypersensitivity, dietary acid intake and erosive tooth wear. *J Dent* 2017;67:84–87.
- O'Toole S, Bernabé E, Moazzez R, Bartlett D. Timing of dietary acid intake and erosive tooth wear: a case-control study. *J Dent* 2017;56:99–104.
- Wiegand A, Schwerzmann M, Sener B, et al. Impact of toothpaste slurry abrasivity and toothbrush filament stiffness on abrasion of eroded enamel – an in vitro study. *Acta Odontol Scand* 2008;66:231–235.
- Schemehorn BR, Moore MH, Putt MS. Abrasion, polishing, and stain removal characteristics of various commercial dentifrices in vitro. *J Clin Dent* 2011;22:11–18.
- González-Cabezas C, Hara AT, Hefferren J, Lippert F. Abrasivity testing of dentifrices – challenges and current state of the art. *Monogr Oral Sci* 2013;23:100–107.
- Reddy A, Norris DF, Momeni SS, Waldo B, Ruby JD. The pH of beverages in the United States. *J Am Dent Assoc* 2016;147:255–263.
- Mesko ME, Sarkis-Onofre R, Cenci MS, Opdam NJ, Loomans B, Pereira-Cenci T. Rehabilitation of severely worn teeth: a systematic review. *J Dent* 2016;48:9–15.
- Loomans B, Opdam N, Attin T, et al. Severe tooth wear: European Consensus Statement on Management Guidelines. *J Adhes Dent* 2017;19:111–119.
- Soares PV, Machado AC, Zeola LF, et al. Loading and composite restoration assessment of various non-cariou cervical lesions morphologies – 3D finite element analysis. *Aust Dent J* 2015;60:309–316.
- Teixeira DNR, Zeola LF, Machado AC, et al. Relationship between noncariou cervical lesions, cervical dentin hypersensitivity, gingival recession, and associated risk factors: a cross-sectional study. *J Dent* 2018;76:93–97.
- Page RC, Kornman KS. The pathogenesis of human periodontitis: an introduction. *Periodontol* 2000 1997;14:9–11.
- Joshi S, Suominen AL, Knuutila M, Bernabé E. Toothbrushing behaviour and periodontal pocketing: an 11-year longitudinal study. *J Clin Periodontol* 2018;45:196–203.
- McGowan T, McGowan K, Ivanovski S. A novel evidence-based periodontal prognosis model. *J Evid Based Dent Pract* 2017;17:350–360.
- Ramseier CA, Anerud A, Dulac M, et al. Natural history of periodontitis: disease progression and tooth loss over 40 years. *J Clin Periodontol* 2017;44:1182–1191.
- Dawson PE. Centric relation. Its effect on occluso-muscle harmony. *Dent Clin North Am* 1979;23:169–180.
- Lundeen HC, Shryock EF, Gibbs CH. An evaluation of mandibular border movements: their character and significance. *J Prosthet Dent* 1978;40:442–452.
- Ekkfeldt A, Karlsson S. Changes of masticatory movement characteristics after prosthodontic rehabilitation of individuals with extensive tooth wear. *Int J Prosthodont* 1996;9:539–546.
- Dawson PE, Cranham JC. Aesthetics and function: conflict or complement? *Dent Today* 2007;26:80–83.
- Dawson PE. A classification system for occlusions that relates maximal intercuspation to the position and condition of the temporomandibular joints. *J Prosthet Dent* 1996;75:60–66.
- Wang MQ, He JJ, Li G, Widmalm SE. The effect of physiological nonbalanced occlusion on the thickness of the temporomandibular joint disc: a pilot autopsy study. *J Prosthet Dent* 2008;99:148–152.
- Zarow M. Finding the Centric Relation – The Kois Deprogrammer. Available at: www.styleitaliano.org/finding-centric-relation-kois-deprogrammer/
- Tjan AH, Miller GD, The JG. Some esthetic factors in a smile. *J Prosthet Dent* 1984;51:24–28.
- Nold SL, Horvath SD, Stampf S, Blatz MB. Analysis of select facial and dental esthetic parameters. *Int J Periodontics Restorative Dent* 2014;34:623–629.
- Hochman MN, Chu SJ, Tarnow DP. Maxillary anterior papilla display during smiling: a clinical study of the interdental smile line. *Int J Periodontics Restorative Dent* 2012;32:375–383.
- Andijani RI, Tatakis DN. Hypermobile upper lip is highly prevalent among patients seeking treatment for gummy smile. *J Periodontol* 2019;90:256–262.
- Van Der Geld P, Oosterveld P, Berge SJ, Kuijpers-Jagtman AM. Tooth display and lip position during spontaneous and posed smiling in adults. *Acta Odontol Scand* 2008;66:207–213.
- Silva BP, Jiménez-Castellanos E, Stanley K, Mahn E, Coachman C, Finkel S. Layperson's perception of axial midline angulation in asymmetric faces. *J Esthet Restor Dent* 2018;30:119–125.
- Bunk S, Zarow M. Fotografia cyfrowa jako składnik nowoczesnej dokumentacji medycznej. *Med Prakt Stomatol* 2016;2:85–91.
- Coachman C, Calamita MA, Coachman FG, Coachman RG, Sesma N. Facially generated and cephalometric guided 3D digital design for complete mouth implant rehabilitation: a clinical report. *J Prosthet Dent* 2017;117:577–586.

REFERENCES

39. Coachman C, Calamita MA, Sesma N. Dynamic documentation of the smile and the 2D/3D Digital Smile Design process. *Int J Periodontics Restorative Dent* 2017;37:183–193.
40. Zimmermann M, Mehl A. Virtual smile design systems: a current review. *Int J Comput Dent* 2015;18:303–317.
41. Dindaroğlu F, Duran GS, Görgülü S. Reproducibility of the lip position at rest: a 3-dimensional perspective. *Am J Orthod Dentofacial Orthop* 2016;149:757–765.
42. Dong JK, Jin TH, Cho HW, Oh SC. The esthetics of the smile: a review of some recent studies. *Int J Prosthodont* 1999;12:9–19.
43. Samet N, Smidt A, Samet N, Weiss EI. A clinical and cost-benefit evaluation of five face-bows. *Quintessence Int* 2002;33:511–515.
44. Squier RS. Jaw relation records for fixed prosthodontics. *Dent Clin North A* 2004;48:vii, 471–486.
45. Gurrea J, Bruguera A. Wax-up and mock-up. A guide for anterior periodontal and restorative treatments. *Int J Esthet Dent* 2014;9:146–162.
46. Vailati F, Carciofo S. Treatment planning of adhesive additive rehabilitations: the progressive wax-up of the three-step technique. *Int J Esthet Dent* 2016;11:356–377.
47. Fabbri G, Cannistraro G, Pulcini C, Sorrentino R. The full-mouth mock-up: a Dynamic Diagnostic Approach (DDA) to test function and esthetics in complex rehabilitations with increased vertical dimension of occlusion. *Int J Esthet Dent* 2018;13:460–474.
48. Coachman C, Gürel G, Calamita M, Morimoto S, Paolucci B, Sesma N. The influence of tooth color on preparation design for laminate veneers from a minimally invasive perspective: case report. *Int J Periodontics Restorative Dent* 2014;34:453–459.
49. Khalifah AM, Celenza A. Teaching and assessment of dentist–patient communication skills: a systematic review to identify best-evidence methods. *J Dent Educ* 2019;83:16–31.
50. Ayn C, Robinson L, Nason A, Lovas J. Determining recommendations for improvement of communication skills training in dental education: a scoping review. *J Dent Educ* 2017;81:479–488.



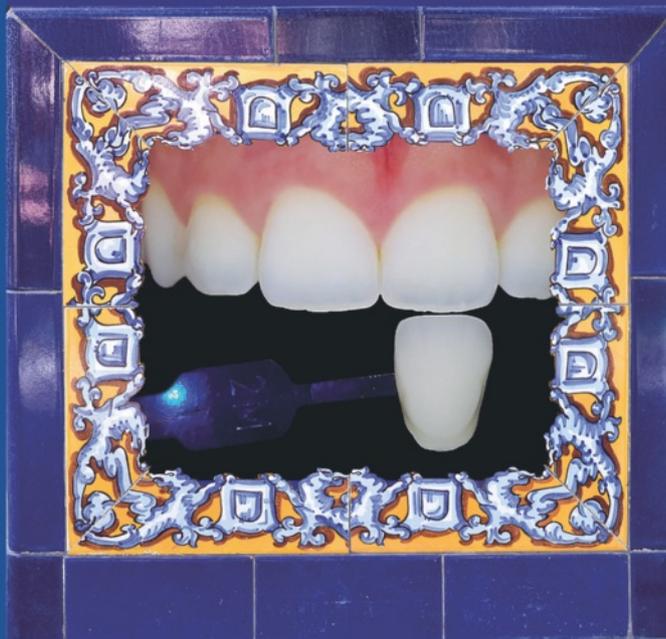
CHAPTER 5



PHOTOGRAPHY COMMUNICATION



LOUIS HARDAN



Communication with
the patient is always a winning
and well-appreciated strategy.
A happy patient will promote
the dentist's work in a very
efficient way ...

Photography Communication

With the constant evolution of digital technology, new and innovative instruments continue to emerge, allowing improved communication efficiently and easily. In dental practice, one of the most important prerequisites to a case's success is good communication with the lab technician, the patient, and even with colleagues of different specialties.

PHOTOGRAPHY: DIAGNOSTIC AND TRAINING IMPORTANCE

When a patient comes to the dental clinic, the dentist should study the case, diagnose, and start the treatment accordingly. Sometimes, the diagnosis is not evident from the start, and a specialist's opinion is required. In the past, the patient was referred from one doctor to another, which took a significant amount of time. Today, with the technological evolution, a simple photograph can be sent to a designated specialist who can request the appropriate tests and sometimes, the diagnosis is directly determined.¹

The photographs in Fig 5-1 show an odd-looking lesion of the tongue. The diagnosis can be critical and should be approached delicately. On the one hand, the diffused light used for the first photograph eliminates hard light reflection and shows the anatomic appearance of the structure. On the other hand, the polarized light used for the second photograph eliminates the glare, which allows more detail to be shown since the expansion of the lesion becomes clearer.²

Sharing photographs between colleagues can prove their importance when transferring a patient from one practitioner to the other, especially when either the dentist or the patient is traveling or moving to another area.

Photographs are tremendously appreciated in the academic field because they represent an otherwise theoretical concept. They can be used to enrich scientific articles and to clarify clinical cases in lectures or workshops.³ A photograph can show a case on a much bigger scale where even the slightest details can be discussed and analyzed; it allows us to explain the drawbacks of any work and how to fix them (Figs 5-2 and 5-3).

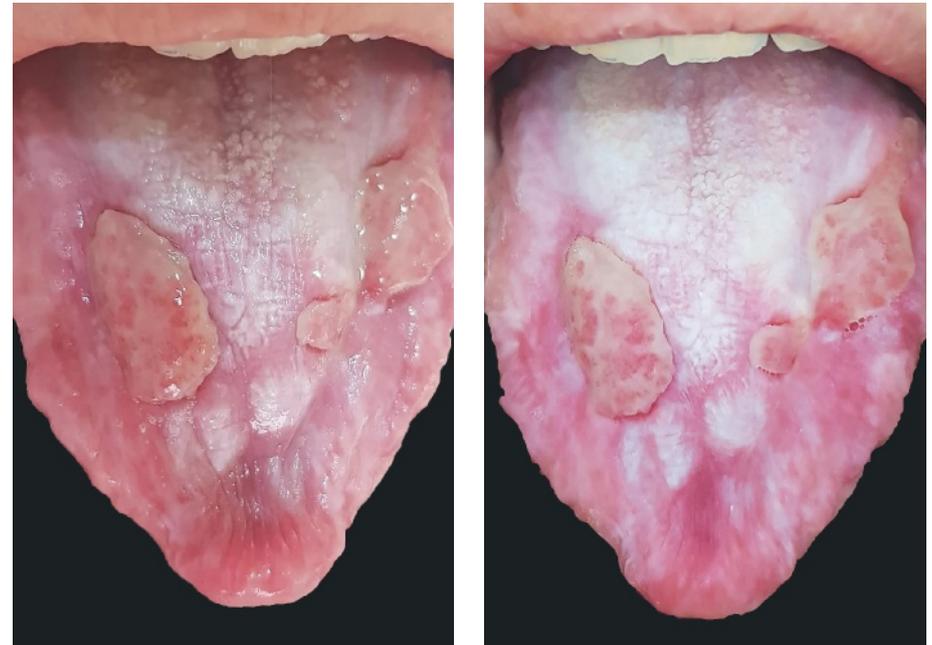


Fig 5-1 Photographs of a peculiar tongue lesion. On the left, the picture is taken under diffused light, while on the right, the picture is taken under polarized light.

PHOTOGRAPHY: DENTIST'S COMMUNICATION WITH THE DENTAL TECHNICIAN

Another important communication in the dental field is the dentist's communication with the dental technician. It is a crucial step in the treatment plan, especially in the domain of esthetic dentistry. High-quality photographs and videos can be analyzed to determine the esthetic association between the face, teeth, and lips. Full information can be transferred via videos since they capture the dynamics of lip movement and facial muscles contractions and their effect on teeth perception.⁴

No matter how much the dentist explains and describes the case and the outcome they seek, it will not be as efficient as a photograph. The SmileLite MDP (Mobile Dental Photography) device forms an easy and practical approach to photography, enabling dentists to take high-quality photographs and videos using their mobile phones (Fig 5-4). Information can then be directly sent to the lab technician using a social media application. With today's technologies and the



Fig 5-2
A student's preparation with sketching shows how to improve the tooth.



Fig 5-3
A photograph showing the defects of a student's impression.

introduction of the digital smile design concept, these tools are now, more than ever, essential instruments in the dental practice. They allow the dentist and their lab technician to design the smile and visualize treatment outcomes before initiation. Several digital smile design software suites already exist, like Digital Smile Design (DSD) and Rebel Dental.⁵ A standardized set of photographs is required for each case, and after analyzing these photographs, a new smile is digitally designed. Then, a mock-up can help the patient see what they would expect at the end of the treatment (Fig 5-5).⁶

Photographs can help the technician visualize the dental environment in which their work will integrate. A large amount of information is transferred through photographs, such as color, shape, alignment, personalization, translucency, opalescence and the halo effect of adjacent teeth.⁷

The SmileLite MDP device emits a light similar to daylight, ensuring ideal conditions for taking a picture. It is also an interesting tool for enabling reliable, simple, and efficient shade matching (Fig 5-6).



Fig 5-4
The SmileLite MDP (Mobile Dental Photography) device forms an easy and practical approach to photography, enabling dentists to take high-quality photographs and videos using their mobile phones.

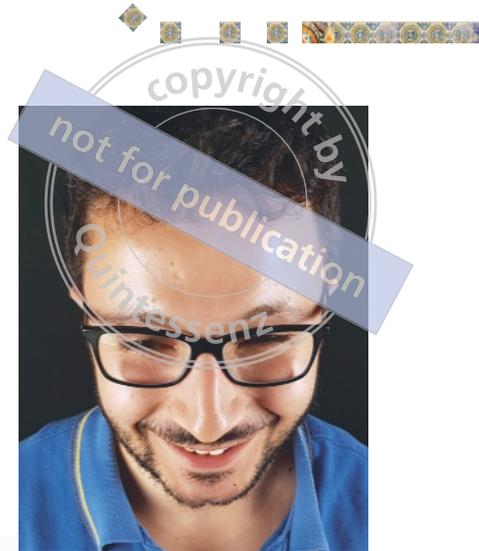


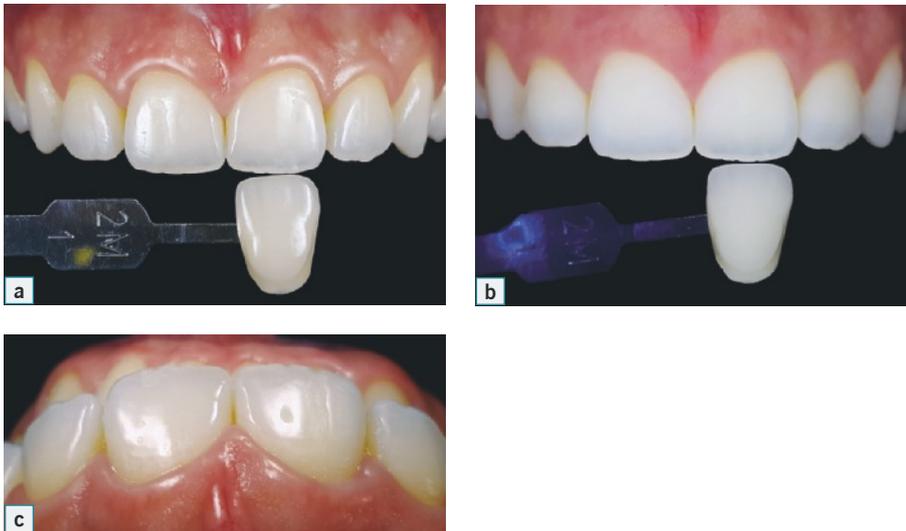
Fig 5-5

Five photographs are required to make a smile design project (REBEL); these photographs can be easily done using a smartphone and uploaded to the software with other data. These photographs are: smiling, lips at rest, retracted open, retracted closed, and 12 o'clock position.



Fig 5-6

The SmileLite MDP (Mobile Dental Photography) device with mounted diffusers and an unmounted polarizing filter.

**Fig 5-7**

Using the different accessories of the SmileLite MDP device, three photographs can be enough to communicate with the lab technician. (a) With diffused light, one photograph should depict an edge-to-edge shade guide with a normal tooth to show the difference between the shade guide and the natural teeth. (b) With polarized light, the same photograph should be repeated (edge to edge) to show the extension of the translucency and its location in the incisal edge, some details like white spots and the difference in color with the artificial shade guide. (c) With the light coming from an opposite side of the camera, a photograph should be taken to show the secondary and tertiary anatomy, because esthetic is not only hue chroma and value but also anatomy.

CORRECT TOOTH SHADE SELECTION

To grasp shade matching, one must first comprehend the concept of color. Color is a subjective notion created in the brain by psychosensory and neurophysiological phenomena following the action of light on retinal receptors. Therefore, color perception is the complex result of physiological, psychological, and emotional phenomena. It is a very personal experience, depending on the training of the observer's eye and can be affected by an existing physiopathology. Thus, shade matching can be a subjective procedure and can vary depending on the individual.⁸

Thus, color perception varies according to the practitioner. Still, it can also vary individually for the same practitioner depending on psychological disposition, age, eye fatigue, saturation of retinal photoreceptors, or chromatic adaptation. In addition to the parameters related to the practitioner, other factors can influence the perception of colors like lighting conditions, colors in the surroundings, patient position, and angle of vision.

To get reliable shade matching results, shade should be treated as an objective science.⁹ By using photography, it can be estimated following objective criteria. An MDP device produces a standardized set of conditions suitable for the dental practice; it ensures a light analogous to daylight, the best light for color perception. Photographs can be analyzed to determine the shape and structure of a tooth, and according to black and white exposure, color values can be detected.

Using the different accessories of the SmileLite MDP device, three photographs can be enough to communicate with the lab technician and give them all the necessary information for the conception of an esthetic and well-integrated restoration (Fig 5-7).

Shade matching can also be achieved for resin composite restorations using the button technique. It consists of placing buttons of resin composites of different shades on a tooth and then taking a polarized photograph. When studying the photograph, the shade of the button that does not appear on the incisal edge is the enamel shade, and the shade of the button that does not appear in the cervical region is the dentin shade (Fig 5-8).

**Fig 5-8**

A photograph under polarized light for shade matching, using the button technique.

PHOTOGRAPHY: COMMUNICATION WITH THE PATIENT

It is important to note that communication with the patient is also essential, but it requires a unique approach since the patient is likely unfamiliar with medical terms. When talking to a patient, the dentist must find a common communication ground. A photograph is the simplest way to ensure easy and clear communication.¹⁰ Images leave an impression on the patient and motivate them to start the treatment.

Patients are getting more involved in decision-making regarding their treatment plan. Dentists can display the current state of the mouth using photographs to explain what needs to be done. When a patient sees, for example, a fractured tooth or caries or any other problem, they understand the issue and appreciate the needed treatment (Fig 5-9).¹¹

The treatment procedure remains a mystery for patients. Now that they know what is wrong and what needs to be done, they remain curious about the potential result and how to attain it. In this field, photographs of previous cases can give tremendous help. Patients can see “before and after” photographs and, as a result, they can visualize the outcome and even the steps of the procedure (Fig 5-10).¹² For example, if a patient is anxious about the preparation of a veneer or an inlay, they can see how much tooth structure is removed and how the tooth is restored. Even photographs of simple procedures, like a composite resin restoration, can help calm and reassure patients that do not know what to expect.

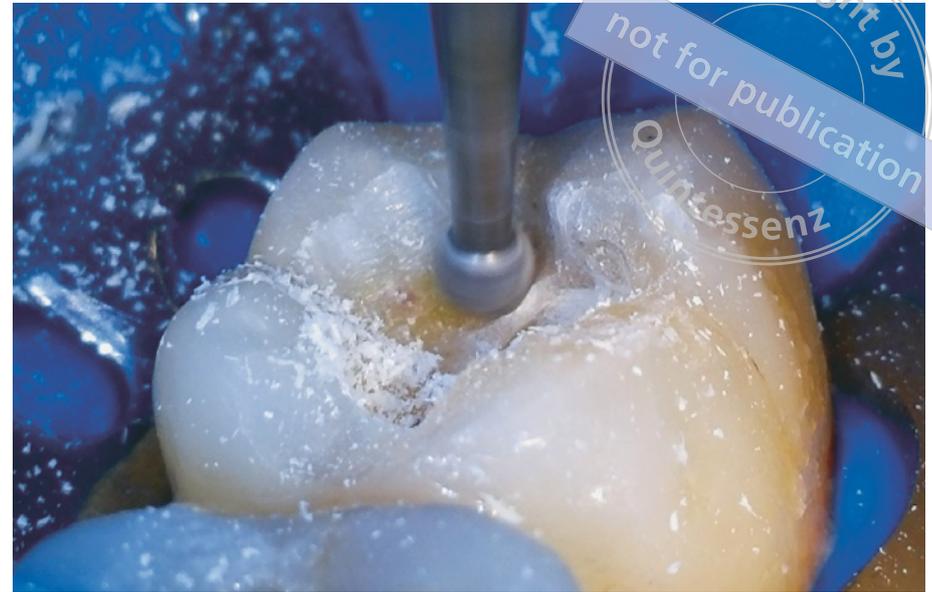


Fig 5-9

Showing the patient a picture of caries removal will make them more confident about the proposed treatment and better understand the procedure that the dentist is performing.



REMEMBER

When talking to a patient, the dentist must find a common communication ground. A photograph is the simplest way to ensure easy and clear communication. Images leave an impression on the patient and give them the motivation to start the treatment



Fig 5-10

“Before and after” photographs of a direct restoration.



Fig 5-11
"Before and after" photographs after a whitening treatment.



Concerning drastic changes in a patient's smile, most people like to consult with others before making important decisions. They seek the advice of people who are close to them to be sure of their next step. This has become more accessible now that the potential result can be seen before starting the treatment. Of course, they can see "before and after" photographs of other patients, but it is much more intriguing to visualize the result on the patient; this is now possible with the new technology of digital smile design. With a few photographs, we can simulate the potential results, and patients can perceive the changes in their smiles and faces before undergoing the treatment. Usually, they are fascinated by what they see; the whole digital experience, followed by a mock-up in the dental clinic, has a "wow effect" on the patients and the people with them. We can also talk about photography as proof of a treatment's evolution. For instance, sometimes at the end of a "whitening" session, the patient is slightly disappointed with the result, simply because they do not remember how their teeth were before the treatment. Patients seek and expect a white color, even if their dentist has already explained that the color will simply be lighter.

A comparison between before and after treatment photographs will convince the patient of the difference that has been made (Fig 5-11).

Another example where it is possible for the patient to not appreciate the evolution of his case is white lesion treatment; even when the appearance of a white spot has tremendously lessened, patients sometimes need to see the proof of this improvement (Fig 5-12). Any dentist can confront the same issue in different circumstances, and it is with the help of photography that the patient is convinced and satisfied.

When the treatment is done, and when the patients are satisfied, they share their new smile on social media for all to see. Patients now have an active contribution to the dentist's work and can greatly help promote and spread this work among their friends and family (Fig 5-13).¹³

Fig 5-12
"Before and after" photographs for a white lesion treatment.

Fig 5-13

Communication with the patient is always a winning strategy and is so appreciated. In the end, a happy patient will promote our work very efficiently.



copyright by
not for publication
Quintessenz

REFERENCES

1. Desai V, Bumb D. Digital dental photography: a contemporary revolution. *Int J Clin Pediatr Dent* 2013;6:193–196.
2. Lazar R, Culic B, Gasparik C, Lazar C, Ducea D. The accuracy of dental shade matching using cross-polarization photography. *Int J Comput Dent* 2019;22:343–351.
3. Binder J, Krautz C, Engel K, et al. Leveraging medical imaging for medical education – a cinematic rendering-featured lecture. *Ann Anat* 2019;222:159–165.
4. Sousa Dias N, Tsingene F. SAEF – Smile's Aesthetic Evaluation form: a useful tool to improve communications between clinicians and patients during multidisciplinary treatment. *Eur J Esthet Dent* 2011;6:160–176.
5. Levi YL de AS, Cota LV de S, Maia LP. Digital smile design for gummy smile correction. *Indian J Dent Res* 2019;30:803–806.
6. Da Cunha LF, Fernandes ABF, Baechtold MS, Correr GM, Gonzaga CC. Cara smile: use of planning software to facilitate esthetic dental treatment in a case. *Indian J Dent Res Publ Indian Soc Dent Res* 2019;30:964–969.
7. Pollini A, Morton D, Arunyanak SP, Harris BT, Lin W-S. Evaluation of esthetic parameters related to a single implant restoration by laypeople and dentists. *J Prosthet Dent* 2019;11:18.
8. Jain M, Jain V, Yadav NR, et al. Dental students' tooth shade selection ability in relation to years of dental education. *J Fam Med Prim Care* 2019;8:4010–4014.
9. Liberato WF, Barreto IC, Costa PP, de Almeida CC, Pimentel W, Tiozzi R. A comparison between visual, intraoral scanner, and spectrophotometer shade matching: a clinical study. *J Prosthet Dent* 2019;121:271–275.
10. Gude T, Tyssen R, Anvik T, et al. Have medical students' attitudes towards clinical communication skills changed over a 12-year period? A comparative long-term study. *BMC Med Educ* 2020;20:11.
11. Kale S, Kakodkar P, Shetiya SH. Assessment of mother's ability in caries diagnosis, utilizing the smartphone photographic method. *J Indian Soc Pedod Prev Dent* 2019;37:360–364.
12. Carlsson GE, Wagner IV, Odman P, et al. An international comparative multicenter study of assessment of dental appearance using computer-aided image manipulation. *Int J Prosthodont* 1998;11:246–254.
13. Alalawi A, Aljuaid H, Natto ZS. The effect of social media on the choice of dental patients: a cross-sectional study in the city of Jeddah, Saudi Arabia. *Patient Prefer Adherence* 2019;13:1685–1692.

copyright by
not for publication
Quintessenz



ISBN 978-1-78698-116-5



9 781786 981165

www.quintessence.publishing.com