

An Atlas of Composite Resin Stratification

Jordi Manauta • Anna Salat

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layers

la·yer ['lā-ər] *noun*. Each of the differentiated parts that, superimposed, form an entire entity.



To my beloved family, To my wonderful woman, To my dearest friends, To my little Xaviera, To Miguel Tamés and Walter Devoto, my teachers, To the loving memory of Carlos Alanís.

Jordi

Dedicated to the unending talent, the tenacity and insatiable struggle, to bright ideas, to the "forever is now," under protests from the hereafter, to passion, in short, dedicated to you, Jordi. Because the book was made possible thanks to you. What seemed so complex has become simple. At the end, it is about simplification, because step by step, LAYER BY LAYER, we did it!



Dr Jordi Manauta

Born in Mexico City, Jordi Manauta graduated with a degree in dentistry from the Technological University of Mexico (UNITEC) with major grants. He continued his postgraduate studies in operative and esthetic dentistry, earning a master's degree from the International University of Catalonia (UIC) in Barcelona, Spain, where he is an associate professor in the Pediatrics Department. He has developed and currently is developing various materials and instruments for esthetic dentistry and photography in collaboration with international companies. A scientific consultant for two European journals and author and coauthor of many publications in international journals, Dr Manauta is frequently invited as a lecturer in these topics.

My family was very intrigued about my lifelong passion for dentistry since I was a child; in fact it was my first choice before a career as an astronaut - at the time I was very serious. My grades reflected this during my studies, even until the very end. The decision to become a dentist was made the day I stepped into a dental office disguised as a young dentist; from that moment I realized that other fields would not allow me to treat patients and at the same time be involved in the artistic work that science is not able to capture and which I found fascinating. I can affirm that becoming a dentist was a decision made with my heart, no brains involved. The same thing happened when I decided to continue my postgraduate education. During that period I found some arrows pointing to an obvious direction, the direction I liked the most.

My first contact with serious esthetic dentistry came one morning when I opened a book about laboratory techniques and ceramic layering. The surprise came when I saw that the author, one of the best technicians in the world, lived a few blocks away from me in Barcelona. I had the chance to meet him, and he told me that the amazing level he had reached had nothing to do with innate skills. The skill he developed was attaching his bottom to his workbench chair.

The only way to feel satisfied is to do a job that you believe is a great job, and to do a great job you need to love what you do, so I wanted to be like the professionals I admired at any cost. I felt as if I was looking at magicians, but I could not be more wrong. Actually their way of handling materials was quite similar to mine, but I questioned why my restorations were so deficient compared to theirs. Was I not using enough colors? What was wrong? I attended many courses and congresses. After a scientific weekend, I used to arrive to the office on Monday and try to emulate my gurus, generally with little success, and after little attempts I felt discouraged and returned to my old habits. It was really hard to distinguish who was an amazing clinician or who lived only to create beautiful presentations.

After some sweat and tears along the road, I realized that personal skills and artistic talent are only an insignificant help. The real helpers here are protocol, neatness, patience, repeating restorations countless times, and of course knowledge. Layering composite made me understand my dull mistakes and helped me to start making worthwhile efforts while restoring teeth.

That is why we entitled this book *Layers*, honoring this noble praxis that should be spread to everyone who is in love with teeth. So here I leave you all the information I have been able to gather, but I want to deliver it to you as my teachers did once with me, unconditionally and with no secrets whatsoever.

Jordi Pérez-Manauta



Dr Anna Salat

Born in Barcelona, Dr Anna Salat graduated with a degree in dentistry from the International University of Catalonia (UIC) in Barcelona. She continued her postgraduate studies in implantology and esthetic dentistry, earning a master's degree from UIC, where she is an associate professor in the Esthetic Dentistry Department. Dr Salat is particularly interested in conservative dentistry and esthetic restorations and lectures internationally on these topics. She has contributed articles to a number of international journals.

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Until a few years ago I practiced general dentistry: I used to lute crowns that I considered "esthetic," or made chameleon-like composite restorations that looked perfect but in the end seemed poorly integrated into the tooth structure. These experiences resulted in a lot of frustration, disappointment, dissatisfaction, and, in my opinion now, an absolute esthetic failure of the treatment.

The truth is that no patients ask for a "nonesthetic treatment." It is our duty to fabricate well-integrated restorations that mimic the natural tooth structure to satisfy our patients. Once a patient told me he was searching for a dentist to cause him to "crack a smile." I thought about the double meaning of this expression: A patient goes to the dentist to improve his smile, but often the treatment turns out to have the opposite result. In many cases, haven't we seen a worse clinical situation after treatment? Think about all those fixed prosthetics with subgingivally located margins that lead to chronic gingival inflammation, overhanging restorations, restorations with inadequate color, form, or texture, and so on. Unfortunately, even overtreatment is not uncommon.

Therefore, I decided I wanted to improve my skills in what we call *esthetic dentistry*. In this way I discovered the world of conservative dentistry, maybe better known as *minimally invasive dentistry*, which at the same time was esthetic. This decision has changed my professional life. Being able to add material to the tooth structure without having to damage even more enamel or dentin, for example, in the case of a fracture of an anterior tooth, where some decades ago a root canal treatment and fixed prosthetics would have been performed. Nowadays, if we stratify the restoration correctly, we can restore this same tooth in a way that perfectly simulates the natural tooth structure, and is therefore invisible to the human eye, without destroying the tooth substrate.

Thanks to adhesion and new composite resins, we are able to offer our patients alternative treatments that are highly satisfying, minimally invasive or noninvasive, versatile, and highly esthetic. I've discovered a whole new world where patients are satisfied and, therefore, I am satisfied as well.

I would like to thank those who motivate me with the quality of their work and give me impetus to improve my clinical skills every day even more. I would especially like to thank the professors who have guided me in my clinical work, Miguel Roig and Luis Jané, chairmen of the Masters of Esthetic Dentistry program at International University of Catalonia in Barcelona, as well as all my teachers at UIC. In addition, thanks to all the professionals whose high-quality results motivate me to improve every day: Walter Devoto, Lorenzo Vanini, Luiz Narciso Baratieri, Angelo Putignano, Daniele Rondoni, and Francesco Mangani among many others.

Anna Salat

Foreword

While writing the presentation for Jordi and Anna's work, this verse by Henry Wadsworth Longfellow came to mind:

> In the elder days of art, Builders wrought with greatest care Each minute and unseen part, For the Gods see everywhere

The meaning of this sentence is clear; artists and artisans of the past had the self-discipline never to allow themselves shortcuts or leave loose ends. They took care with every detail, even with invisible things, because they firmly believed that the final judgment on their work was passed not by others, but by something much higher, their own conscience.

We had the same sensation while exploring these pages.

Jordi and Anna, our students in the recent past, have grown up knowing that professional success is inextricably bonded to one word: PASSION. Passion leads us to be curious, to explore new materials and techniques in order to improve our skills, to follow strictly the knowledge of our teachers, and to repeat countless times these exercises until the desired result is achieved.

In this text, passion is breathed on every page, from the exciting and illuminating step-by-step pictures, through the care taken in every graphic detail, to the words of all the colleagues who have agreed, enthusiastically, to introduce the different chapters.

This is not a book that will sit unread in your dental library, accumulating dust. Instead it will be browsed daily by students, young dentists, and expert colleagues looking for inspiration for their esthetic restorations, encouraged by exposure to the details that make the difference in our profession.

Philosophy can become science, but to do so, art has to get involved in between, and in this book none of them are missing.

We wish the two young authors the editorial success that they deserve, confident that their passion will involve all of us.

Good reading. Walter Devoto and Angelo Putignano



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To our assistants in Italy and Spain. Half of what we are is because of you.

To the ones who have suffered from our chaos and desks full of composites. Let us dedicate this book to you. In the end it was not such a mess. We love you!

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To anyone whom we wrongly and unfairly did not mention. Unfortunately we do not have enough space in this whole book to mention everyone we wish. Forgive us.

An apology to our family and friends — nothing, absolutely nothing, is worth spending time away from you.

Sincerely, Jordi and Anna

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Modern research is focused on biomaterials, tissue regeneration, stem cells, and healing. Some of these concepts are still science fiction, but we hope just for a short time. At present some great technologic advances and research have provided incredible, functional materials that have helped solve some problems, although never as accurately as the natural materials. Each layer has an infinite value; an intact tooth is always our first option before any dental material, despite its alleged advantages.

A journey through tooth layers and the different approaches to them will at least give us the knowledge to treat their diseases and mimic their beauty.

We need to understand color, thickness, opacity, arrangement, aging, size, shape, orientation, abnormalities, and how time plays gracefully with them.

After reading this text we are sure you will learn at least one thing, to love a tooth.

We would like to invite you on an incredible journey of 13 chapters just to understand basically two incredible layers that sometimes are lost and it is our beautiful everyday work to replace.

Vanini's stratification technique

The main objective of this technique is to develop the primary structures of the tooth with the aid of an accurate silicone guide to improve precision of the modeling of the palatal structures, reduce modeling time, and focus on desaturation of dentins to achieve natural chromaticity and precise thicknesses of enamel and dentin in the restoration. The materials we will use (Enamel Plus HFO and HRi) were designed to be used with this technique.

The bases for constructing the dentinal body are:

- A high chromaticity core.
- Chromatic desaturation from cervical to incisal and from palatal to facial.
- Placement of multiple layers to gain depth and in this way avoid monochromatic structures.
- Control of contraction and polymerization through multilayer application.

A colored tooth, A2 for example, should always be started with the help of a silicone guide used to construct an enamel shell and facilitate application of the three universal dentins (UD), which correspond to A4, A3, and A2, from the depth to the surface.

A thin (0.5-mm) layer of medium-Value enamel is constructed with the aid of a silicone matrix, a thin spatula, and natural bristle brushes. Once this layer is thin and uniform, it must be cured for at least 20 seconds. Then the proximal walls are built with the help of matrixes and wedges, until a height similar to the total volume of the tooth is achieved, forming a shell that will house the dentinal body and serve as a reference during the stratification phases.



Correct order of composite resin layers, from dark to light Chroma. Note the oblique disposition of dentin layers.





Use of a silicone index makes it easy to fabricate a palatal structure. Proximal walls are created with the help of matrixes or freehand when adjacent teeth are not available. The aim is to obtain a shell that will act as a container.

The five opalescent types

The incisal portion of the dentin has mamelons that are responsible for giving shape to the opalescence; the enamel located in the incisal edge lets light pass freely; this area is a critical point where opaque dentin and translucent enamel coexist and interact to form the most interesting area of a tooth.

Type 1 opalescence

Consisting of three mamelons, this opalescence is common in newly erupted teeth and teeth that have not been worn yet. Each mamelon corresponds to one developmental lobe. Patients with open bite or inability to have incisor contacts typically present this three-mamelon shape throughout life. The mamelons differ in size:

- Mesial: Vertically longest
- Central: Horizontally widest
- Distal: Smallest

Type 2 opalescence

This type is characterized by four mamelons or by three mamelons with the central mamelon, which is the widest, divided in two, at least optically, creating the effect of four mamelons. Type 2 is frequently found in the teeth of children and young adults. The division of the central mamelon is caused by enamel hydration and physiologic wear. The mesial and distal mamelons are still visible and frequently symmetric. Opalescence is evident on the distal and mesial areas, while the center looks more diffuse:

- Mesial: Longest and widest
- Central: Appears separated into two or more mamelons, and their individual sizes are usually small
- Distal: Medium sized

Type 3 opalescence

Type 3 is a multiple-mamelon effect in which a physiologic division that has occurred in the three lobes results in an optical effect of 6 to 10 (or more) mamelons. This type of opalescence is common in the teeth of middle-aged adults and older adults, although this can vary significantly at any age.

Type 4 opalescence

This type of opalescence marks the conclusion of changes in mamelons over time. The enamel opacity decreases and allows light to travel more efficiently along the incisal edge. This type of opalescence is also detectable at earlier ages in individuals whose teeth do not have marked developmental lobes. Type 4 opalescence is seen as a straight line on the incisal edge that signals the outlined end of the dentin without mamelons.

Type 5 opalescence

Type 5 is proximal opalescence, normally present in all teeth, regardless of their incisal edge. Sometimes it exists alone and frequently is found in conjunction with the other types of opalescence.



The same opalescent mass will be placed on top of each dentinal core, demonstrating that the shape of the dentinal core is essential for the incisal edge. With a high-quality opalescent mass, every type can be correctly recreated. Although hundreds of opalescent shapes can be found in nature, a five-group division seems to be an easy to understand classification because of the common characteristics shared by most teeth. Each tooth has its individual opalescent shape, and it can be expressed from its most subtle forms to the strongest.



A standard dentin stratification is needed to start the palatal surface.



The marginal ridges are increased with a less chromatic dentin.



It is preferable to build one ridge at a time.



Internal gradient layers will be developed from the bottom of the lingual pit using a brown stain.



A mixture of opalescent amber and a dark brown stain is applied to cover only one-third of the palatal surface.



A mixture of opalescent amber and a light brown stain is placed, extending slightly further than the previous layer.



An amber opalescent mass is applied to extend to the middle third. The effect will be subtle but effective.



An orange stain or a cervical mass can be used to increase the Chroma significantly.



The opalescent mass is placed in the incisal edge.



Marginal ridges are enhanced with a white opalescent enamel.



The cingulum and lingual ridge are also modeled with white opalescent enamel.



It is important to create the lingual pits if stains have to be added in later steps.

Palatal Stratification When Space Is Available





Mamelons are characterized with an light intensive white (+) effect.

After the intensive is evenly distributed, this effect provides a natural appearance.



The surface is covered with the medium-Value final enamel mass.



Characterization starts with an orange stain, which is almost invisible and should not be polymerized.



A light brown stain is placed to outline the ridges internally. This stain will not be polymerized.



In the center of the lingual pit, a dark brown stain will be placed, mixed with the previous stains, and polymerized.



Finishing is accomplished with a diamond bur.



Polishing is accomplished with diamond and aluminum oxide pastes.



Ceramist: Ferran Puig, Mollerussa, Lerida, Spain.

Working with Ceramics

Ceramic layering is particularly difficult, because postfiring shrinkage must be taken into account. Natural posterior anatomy depends primarily on two factors, sharp relief and well-defined grooves.

This is performed with appropriate space distribution, making the tooth anatomically correct and therefore more esthetic. If we have correctly defined the so-called fish mouth (perimeter limit of the occlusal surface), it is much easier to manage the occlusal area. In this way, modeling becomes more predictable. It is always advisable to start with the external portion of the cusps and close the perimeter cusp by cusp. As with composite, when ceramics are used the occlusal surface is developed using the sectional technique with just minor modifications regarding the handling.

Morphology: For a natural posterior anatomy, it is necessary to work with an extremely fine-tipped brush (N.Era, Smile Line), which will allow us to reach any area in the occlusal surface. The mass must be provided with optimum texture, so the ceramic mass has to be malleable and have plasticity. In this way we can reproduce any desired detail by adding small increments of ceramic and packing it with the brush.

Grooves: Correct definition of the sulci with the fine-tipped brush is essential before firing. There is a high risk of postfiring ceramic separation when the sulci are defined with sharp instruments such as endodontic files or blades.

Surface texture: The smoothing of raw ceramics with an extra-smooth brush allows creation of a very precise surface. For a magnificent final effect, a mixture of 50% glazing powder and 50% ceramic will be placed on the ridges to highlight and enhance the anatomy of the internal portion of the cusps.

Ceramic dehydration: When modeling takes too long, ceramic masses start to dry. There are two ways to recover moisture: The first is to have an atomizer with distilled water available, and the second is to create a capillary effect by connecting the crown to our liquid container with an absorbent strip of paper; the latter technique may take longer but the hydration is more effective.



