

# Mastering more than anterior composites

IPS Empress® Direct

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A handwritten signature in blue ink, appearing to read 'Eduardo Mahn', written on a white surface.

# Preface

The idea of this Special Edition started many years ago when I realized how little knowledge and skill I had after finishing dental school. At that time I started my search for practical information that could help me tackle simple day-to-day clinical dentistry problems. Over the years I was lucky enough to meet some very special people who taught me how to learn from others and rethink certain aspects of dentistry. I am much indebted to these mentors.

Over time I collected insights that I shared with others whenever I could, in courses, lectures and articles. With the feedback of all the people involved, we were able to develop and improve certain concepts. These concepts matured along the way and we were able to implement them in clinical cases that were documented: for example, the correct use of opalescent materials, basic anterior tooth anatomy, and the use of the line angles or mesio- and disto-labial ridges. We also explored ways of achieving the correct texture and opacity of restorations and of properly layering composites. At the same time, we tried to find solutions that would not be complicated and time consuming.

I have read articles describing cases where 10, 12 or more shades were used! Is this really necessary? Quite honestly, I think it is not! I have also spent a lot of time finding out how to choose the proper shade of the composite. Over time I have realized that this task is not as important as we had thought. I have also asked myself, which is the best or easiest composite to use. Many more questions arise when working with composites. Can we save time when curing? How large can the increments be? Should one bevel or not? If the answer is yes, then when and how? Should wedges be used in the anterior region, or is it better to avoid them? We could keep on discussing aspects such as these for a long time.

This Special Edition on the topic of IPS Empress® Direct will try to provide answers to the most simple questions, but also to more complex situations based on the evidence we currently have and the practical experience we have gained over the last decade. All the examples will be shown in high resolution, with fully documented cases, step-by-step procedures and practical examples from our daily work.

*I would like to thank my brother Gustavo Mahn for his valuable help in the realization of this document.*



# Understanding teeth

Teeth are highly calcified complex crystalline structures. Their function is to mechanically break down items of food by cutting and crushing them in preparation for swallowing and digestion. At the same time, they are a key factor in our smile and a crucial aspect of our appearance. The latest developments in dental materials science allow the clinician and technician to biomimetically reproduce the optical appearance of teeth. Understanding the optical properties of teeth is fundamental to succeeding in modern esthetic dentistry.

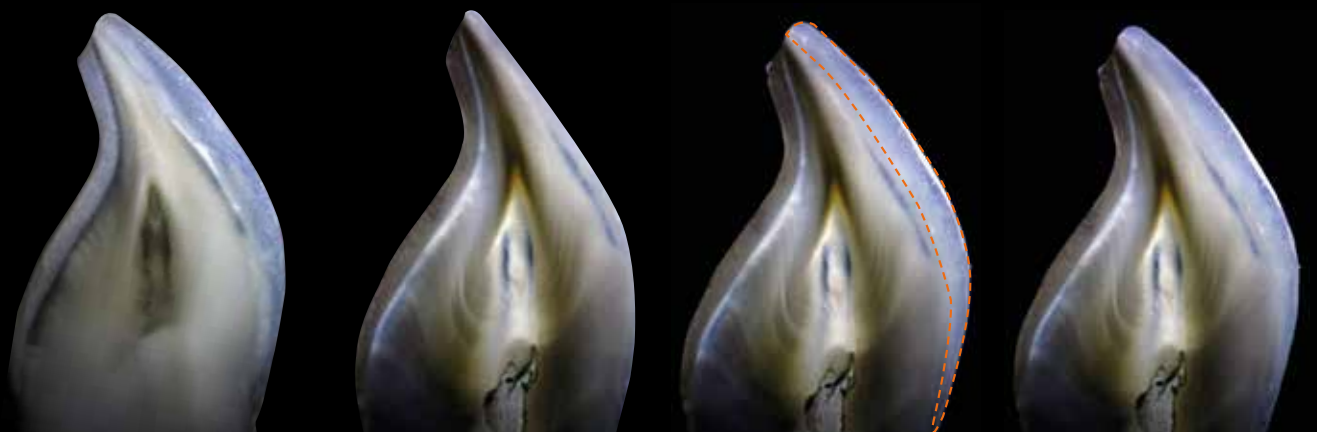
Since composite materials are mainly used to restore lost enamel/dentin in direct techniques, understanding how we have to layer such materials is paramount for achieving successful esthetic outcomes. The materials should emulate the natural characteristics of both types of tissue. The pictures below show how efficiently the translucency, opalescence and light reflection properties of teeth are imitated with IPS Empress Direct Enamel shade.

From an optical perspective, dentin is more opaque and has more chroma than enamel. This arrangement is challenging for the clinician because of the intrinsic difficulty of emulating opacity gradients and thicknesses.



Visible optical effects with different light sources

Dentino-enamel junction: In histological cuts, it looks extremely translucent, with very opaque dentin underneath and more translucent enamel above.



Natural enamel

Enamel was removed.

Direct veneer IPS Empress Direct Enamel

With the right combination of shades, IPS Empress Direct emulates natural enamel.

# Understanding dental histology

When making anterior restorations, enamel and/or dentin have to be restored. The recreation of the anatomical form and optical properties constitutes a very challenging and most of the time elusive exercise. Enamel is based on hydroxyapatite, which is organized in directional prisms from the dentin-enamel junction towards the external surface. The prisms are arranged in bundles, which are multidirectional in the inner third (H-S Bands) and unidirectional, perpendicular to the outer surface, in the external two thirds. This exceptional feature makes this, by definition brittle tissue, more compression resistant thanks to its biological synthesis during amelogenesis. Due to the highly mineralized content and special histological arrangement, enamel is colourless and translucent, but full of optical phenomena, which are challenging for the clinician to reproduce.

Dentin has a high organic content (mainly type I collagen) and is organized in tubules, which run perpendicular from the pulp to the dentin-enamel junction. This unique histology makes this tissue highly elastic and more prone to pulp reactions. Both dentin and enamel intermingle between the inner aprismatic enamel and the outer layer of dentin, also known as "mantle dentin". This underrated structure, known as the dentin-enamel junction, has a localized reduction of mineralization and density, which contributes to the ability of teeth to withstand mechanical stress.



All the images are of mineralized 100 micron cut specimens, viewed through an epi-illuminated loupe, showing dentin (pale yellow) and enamel (light blue)



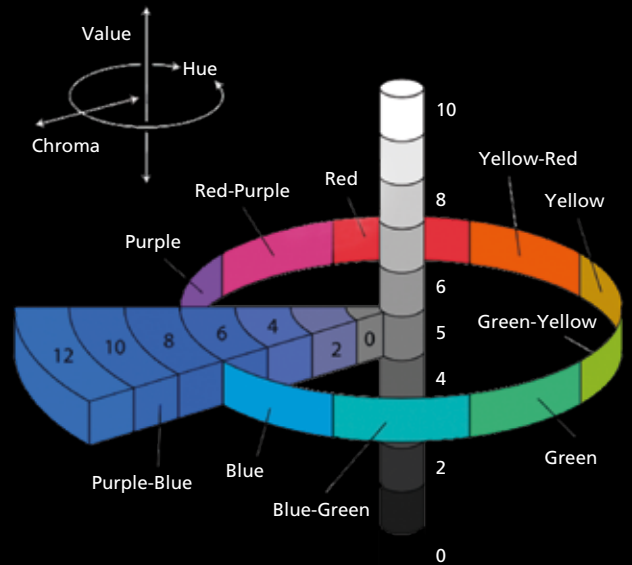
# Understanding colours

The Munsell colour system is a colour space that specifies colours based on three dimensions: hue (the actual colour or shade), value (lightness) and chroma (saturation). This system offers the most appropriate way of describing the light interaction with dental hard tissues. Classically, teeth are divided into thirds: cervical, middle and incisal (see next page). The cervical third is high in chroma, medium in value and tends to have a yellowish-reddish hue, due to the gingival shade influence. The medium third has less chroma, same value and less intense hue. Normally no gingival shade influence is noticeable. The incisal third shows more optical effects like opalescence, halo effect, amber effects and visible dentin mamelons. It has low chroma, low value and minimal shade presence.

In addition to Munsell's three dimensions, certain modifying optical factors need to be considered in order to understand the appearance that a highly esthetic restoration should have. The common ones are as follows: opacity and translucency, opalescence (in conjunction with visible mamelons), fluorescence and the halo effect.

Tooth shades are classically divided in the A–D shade guide, with each letter having 3 to 5 levels of chroma. The A shades tend to be more reddish, the B more yellowish, the C rather yellowish-grey and the D shades rather reddish-grey (brown).

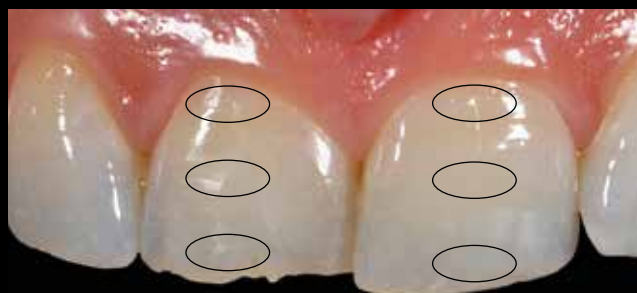
**Munsell Colour System**



# Shade selection

When the shade is determined and the clinician has to decide which shades he or she is going to use, the area of the tooth that is in this process plays a significant role. It is commonly accepted that the cervical region is useful for taking the dentin shade and the incisal third for the enamel shade.

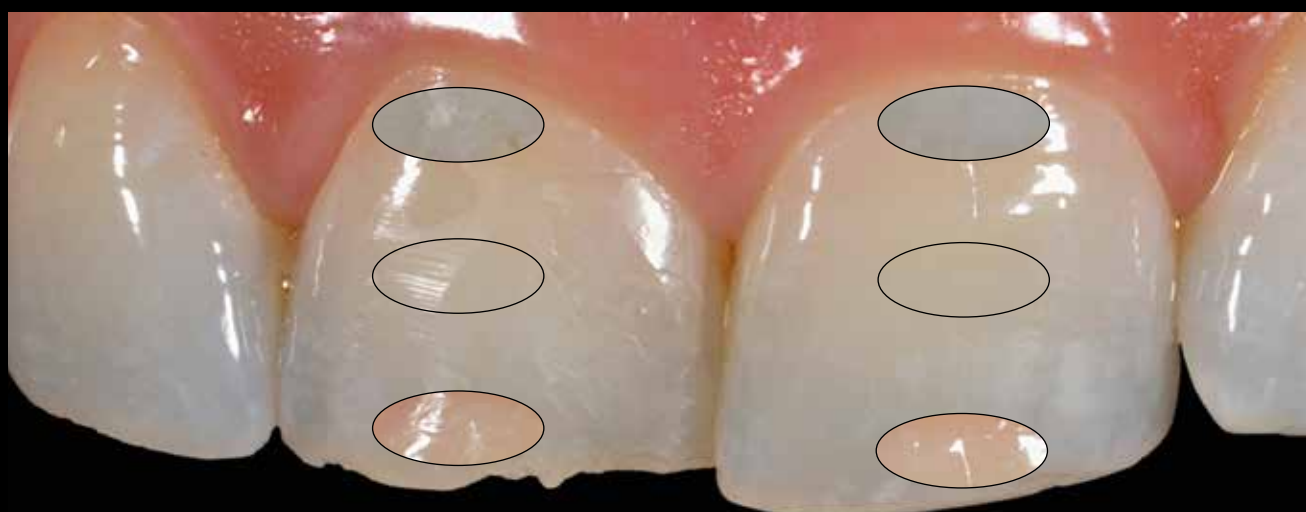
In order to understand the accuracy of the measurement, we draw circles within the thirds and we isolate them.



We switch off the surrounding light.



We move the cervical circle to the incisal and vice versa.



When we switch on the surrounding light the influence of the pink gingiva is evident. We will also note a greyish effect on the incisal third, which is now cervically located. This exercise helps us to understand that the middle third is the most reliable area for determining the shade. In the case of a composite like IPS Empress Direct, the dentin and enamel shades should be determined in this area. Normally, we achieve great results by correlating them one to one. In other words, if we choose Dentin A2, Enamel A2 will come on top. Sometimes we use one shade brighter for the enamel.

# Opacity and translucency

Opacity is the quality of a material that does not allow light to pass through it. Transparency is the contrary concept. It is the property of transmitting light without appreciable scattering so that bodies lying beyond are seen clearly. Translucency refers to a state of something that is not completely clear or transparent but clear enough to allow light to pass through. The classical example showing a glass of milk with different amounts of water added (see pictures below) illustrates the different appearances of human teeth. Teeth are opaque to a certain degree because of their dentinal core. However, in some areas they are translucent to variable degrees due to the overlaying enamel.



What do these two fillings have in common and why have they both failed? Obviously both have several problems. Many aspects are far from ideal, but the main problem with these fillings, apart from their contours, incisal borders, bevels, texture and much more, is their inappropriate opacity. And this is the reason why most anterior composite fillings fail.

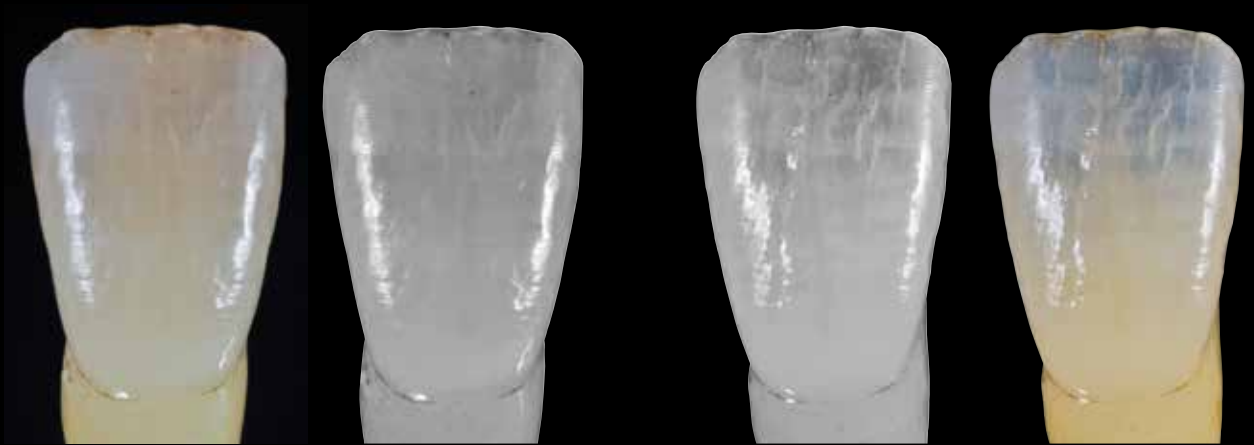


A black and white picture shows a clear difference in the values of the fillings and the natural teeth in both cases.



# Opalescence

Tooth colour is influenced by a combination of intrinsic colour and the presence of extrinsic stains that may form on the tooth surface. Light scattering and absorption within the enamel and dentin creates the intrinsic colour of the teeth. Furthermore, since enamel is relatively translucent, the properties of dentin can play a major role in determining the overall tooth colour. Depending on the type of light and its direction, the appearance of the teeth can change. This effect is mainly because of the opalescence of enamel.



A normal central incisor which looks as we would expect.

The same tooth only with the enamel shell; the dentin core was mechanically removed.

When dentin is removed, the natural opalescence of enamel can be appreciated.

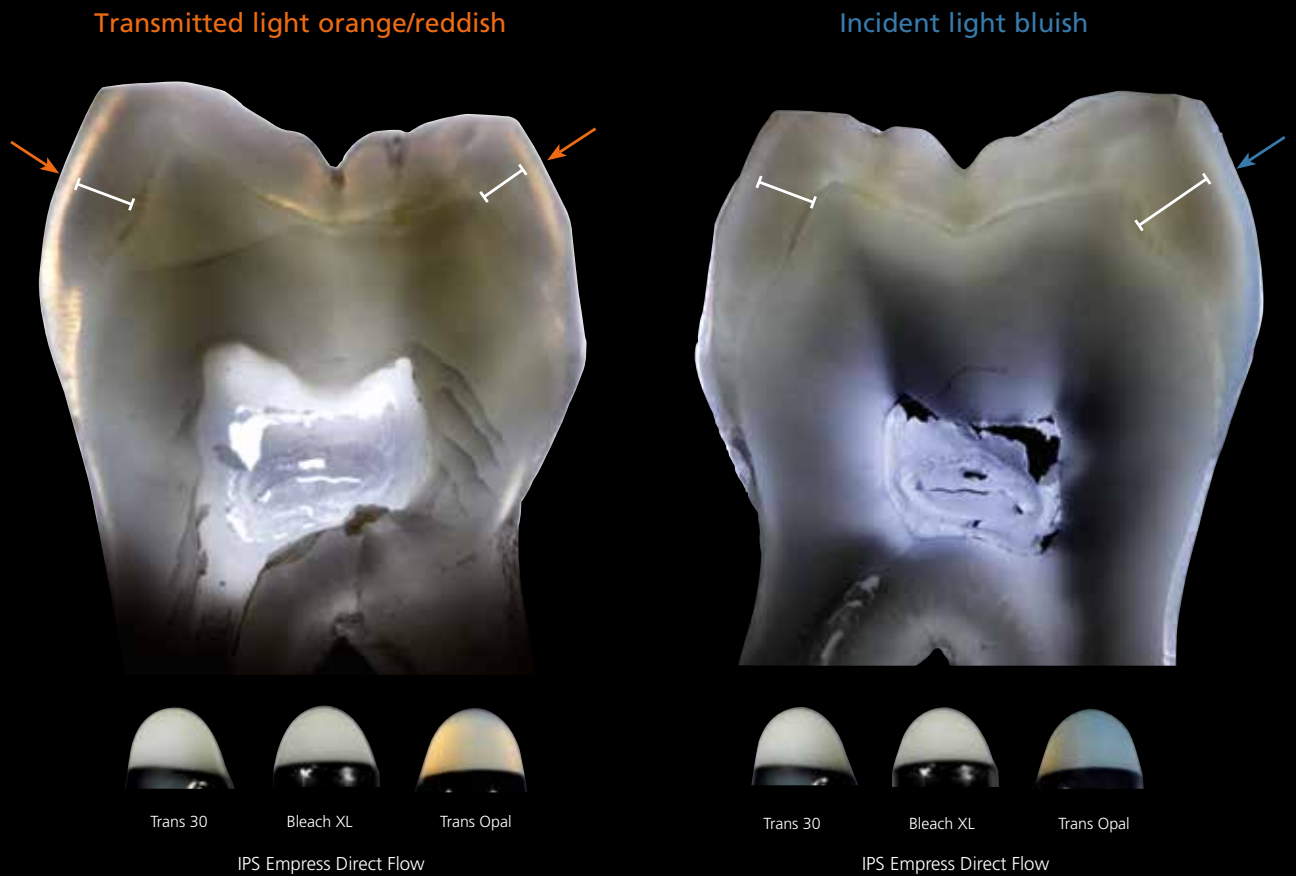


Transmitted light

Incident light

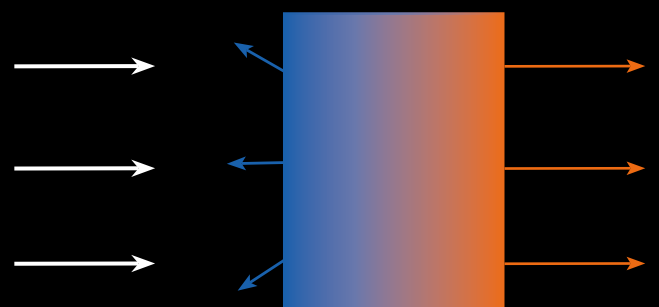
Opalescence is a type of dichroism seen in highly dispersed systems with little opacity. The material appears yellowish-red under transmitted light conditions and blue under incident or scattered light perpendicular to the transmitted light. The phenomenon is named after the appearance of opals, which are the national gemstone of Australia, a mineraloid and an amorphous form of silica.

A typical example of opalescence is the blue sky in the daytime and the yellowish-red sky at sunset.



In posterior teeth the same effects are visible, this is the reason why a shade like OPAL from IPS Empress Direct is so important in the layering concept.

It is available in a sculptable presentation and in a flowable one.



Incident light and transmitted light phenomena

# Fluorescence



Natural tooth

1 mm



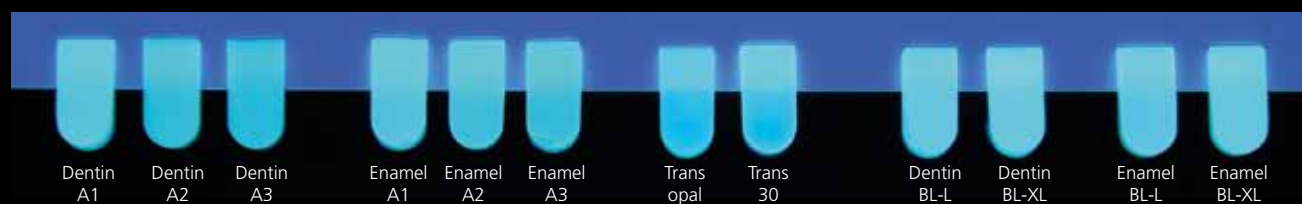
Natural fluorescence

1 mm

Source: Courtesy of Gustavo Mahn

Dentin is visibly more fluorescent than enamel due to its higher organic composition. Note the dentin-enamel junction zone which looks even more fluorescent than the circumpolar dentin. These effects need to be taken into account when layering.

## Fluorescence of the IPS Empress Direct Dentin and Enamel shades



All shades are fluorescent

Source: V. Brosch, Germany

# The halo effect



The halo effect is another natural visual effect which is commonly integrated into restorations. In natural teeth, the halo effect is caused by the reflection of red-yellow wavelengths of the internal lingual-incisal surface of enamel. The actual incisal enamel is not any different from the rest of the body of enamel in terms of colourants/stains. The red-yellow light hits the surface at a low incidence angle and therefore does not transilluminate. Instead,

it reflects or scatters off the buccal-lingual-incisal surface. The scattering halo effect will occur in natural teeth when there is a buccal-facing lingual-incisal surface of enamel at a right angle. Most unworn incisors will exhibit a halo. Not all teeth with incisal wear facets will yield this visual effect. The wear facet must have a buccal-facing angulation.

Technicians have traditionally created an artificial halo in restorations by either using more opaque porcelain or layering stains into the incisal edge. These halo effects can be easily lost, however, through wear of the restoration or occlusal adjustments in crossover movements made by the restorative dentist.

The same principle applies to composites. Traditionally, clinicians have created halo effects by placing a more opaque or "milk-like" composite shade at the incisal border to reproduce this effect. Nevertheless, through wear or occlusal adjustment this artificial halo disappears. This is the reason, why ideally this effect should be created by the proper angulation of the incisal border of the restoration, which should be close to 40 degrees.



Correct angulation of the incisal border for a natural halo effect

# Basic anterior tooth anatomy



Centrals differ from laterals and canines in shape and size. The frontal view gives us a lot of information, but we also need to understand the three-dimensionality of teeth.



A central incisor from different angles



# Surface texture

Because teeth have a certain texture, the ideal surface polisher should not be too abrasive. This is the reason why we prefer to use rubber polishers like Astropol® over discs.



Teeth have areas with different textures



Astropol system



Grey cup from Astropol

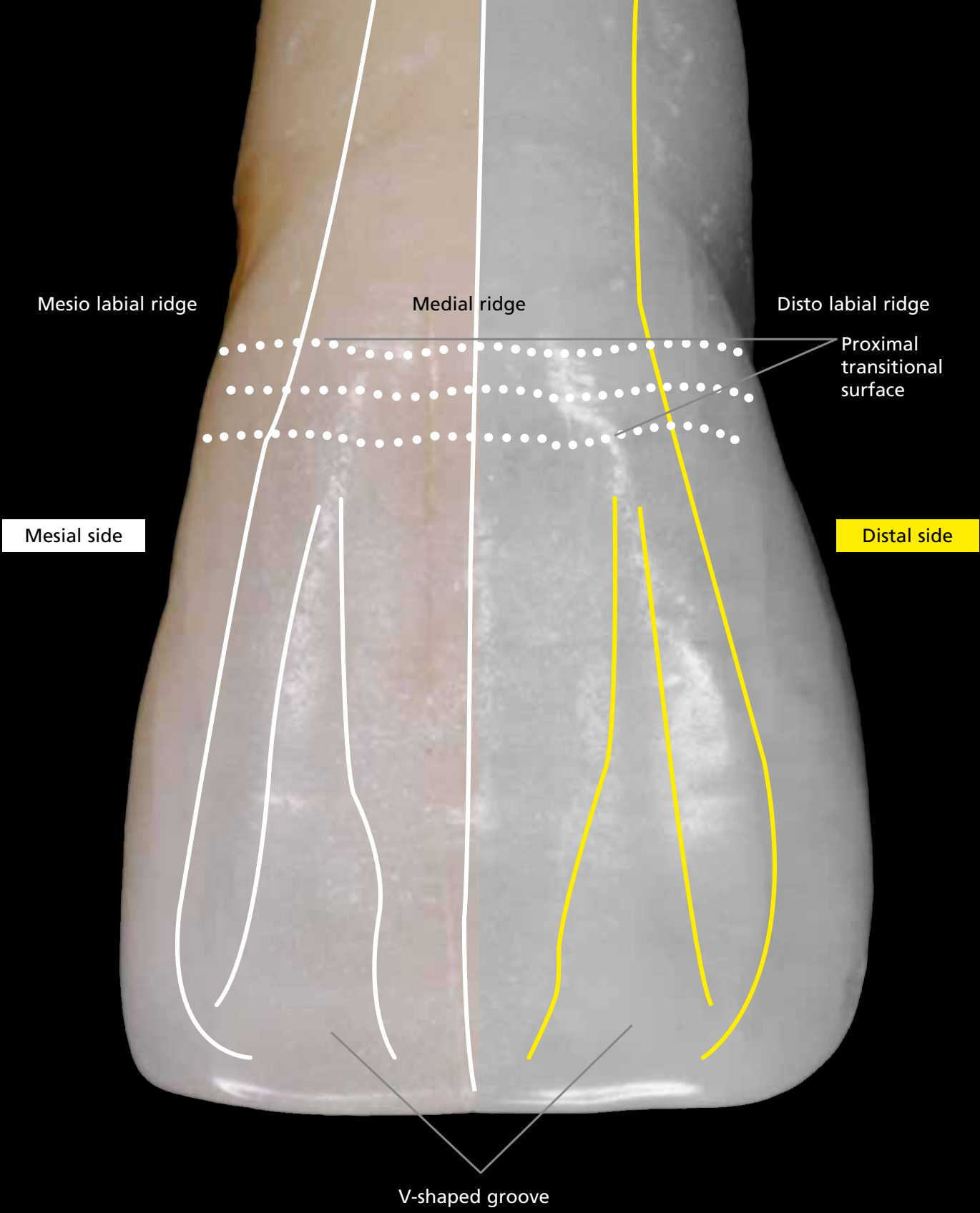


Soflex discs



Microtexture of a canine: clearly visible, especially in the cervical area

Source: Courtesy of Gustavo Mahn



Basic anatomical structure of a central incisor



Dried tooth

Reflection lines (also known as marginal ridges or line angles) have to be created and evaluated after the surface has been dried. The pictures above show the dried tooth, while the picture below in the middle shows the tooth with a small drop of water and the picture below on the right shows the tooth completely wet. These lines are fundamental to the final appearance of direct as well as indirect restorations, because they represent the most prominent volumetric part of the ridge, defining the limit of the buccal surface and the interproximal embrasure. Their different positioning determines how wide or narrow a tooth can look without changing the real width.



Reflection lines: dried tooth



Reflection lines with a small drop of water in the incisal third



Reflection lines when tooth is completely wet

We need 12 points and 2 double lines to create a central incisor

1  
2 Mesial contact

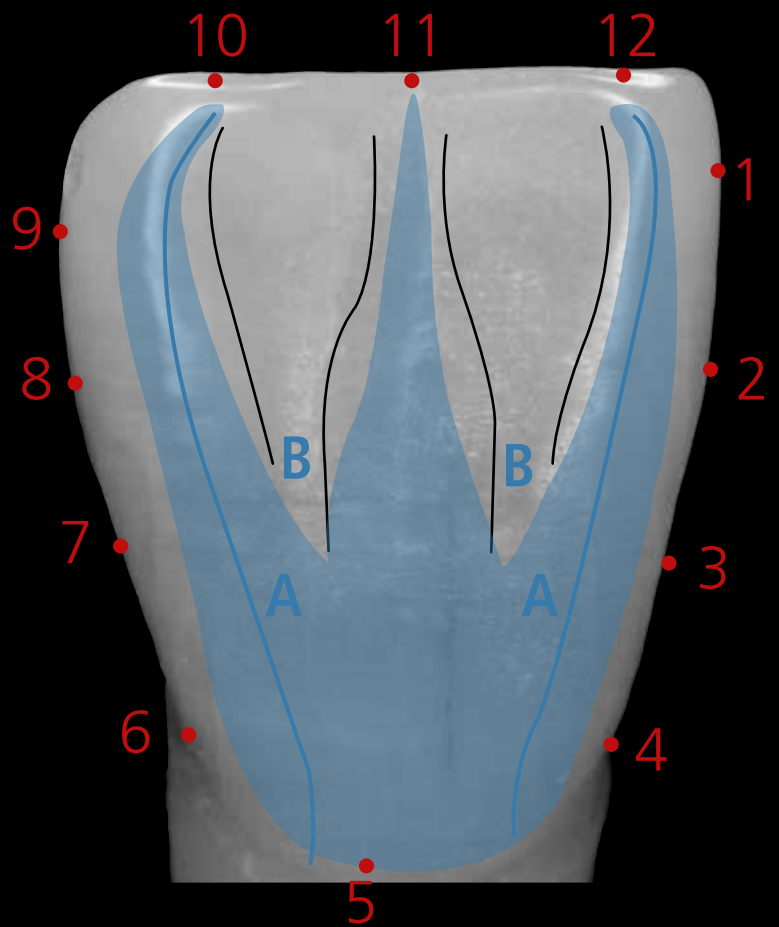
3  
4 Mesial emergence profile

5 Gingival zenith

6  
7 Distal emergence profile

8  
9 Distal contact

10  
11 Incisal border  
12



A Reflection lines or marginal ridges

B V-shaped grooves

# Layering concept

The layering concept should fulfil three basic prerequisites:

1. It should be simple and easily reproducible.
2. It should be fast and efficient.
3. It should meet all types of clinical challenges.

This 3 basic prerequisites are always fulfilled with our 5 steps technique (see below), for all cases with only minor changes between different patients:

Some people might need more dentin, others more enamel, some stains, Opal or special effects, but the concept and the 5 basic steps remain the same.

In this particular example we used:



Background: IPS Empress Direct Enamel A1



Body: IPS Empress Direct Dentin A1



Effects: IPS Empress Direct Flow Trans Opal



Contours and special effects: Tetric EvoFlow A1

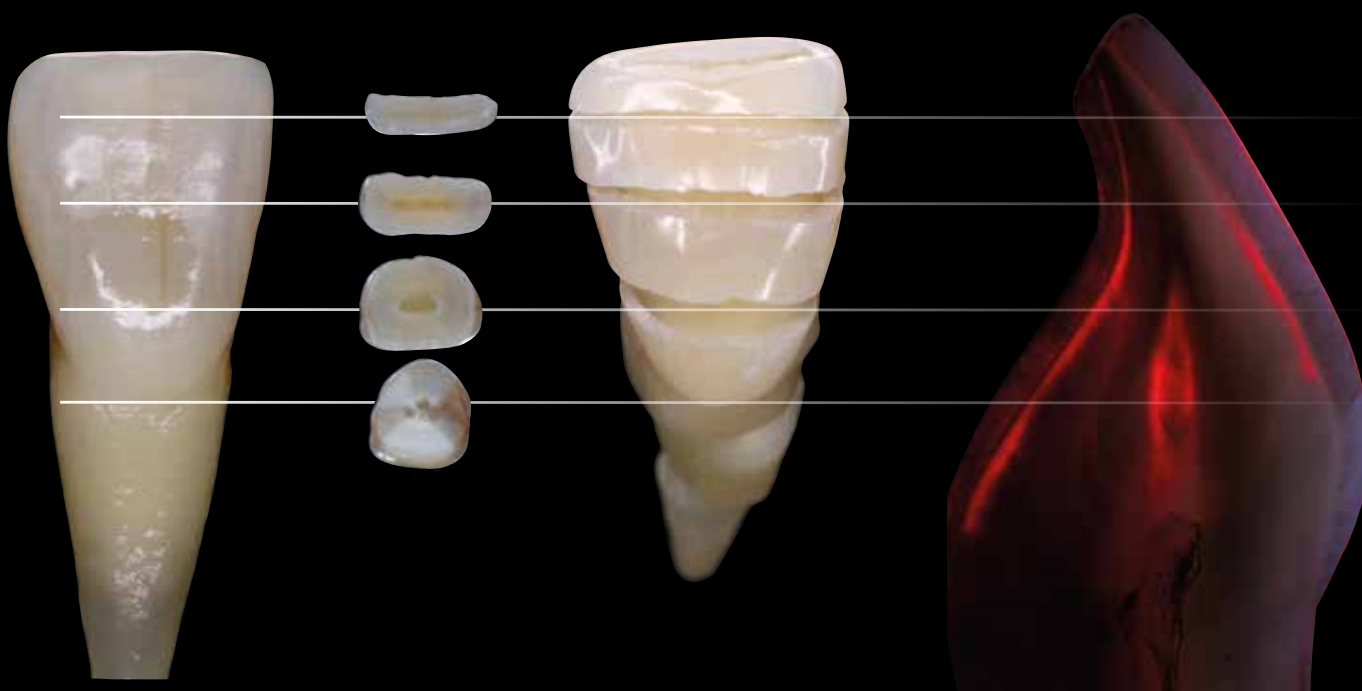


Final coverage: IPS Empress Direct Enamel A1



# Dentin-enamel ratio and tooth

The thickness of enamel varies in the different parts of the tooth: thicker on the buccal aspect and thinning out towards the cervical area. The dentin core also varies, becoming thicker in the cervical part of the tooth. As a consequence, the relationship of their thicknesses tends to be inverted. These variations need to be taken into consideration when layering. The pictures below show how the shape of a central incisor differs from the side and from the incisal view. These changes need to be taken into account when the composite is layered.



Gradual changes in shape, contours and enamel-dentin ratio

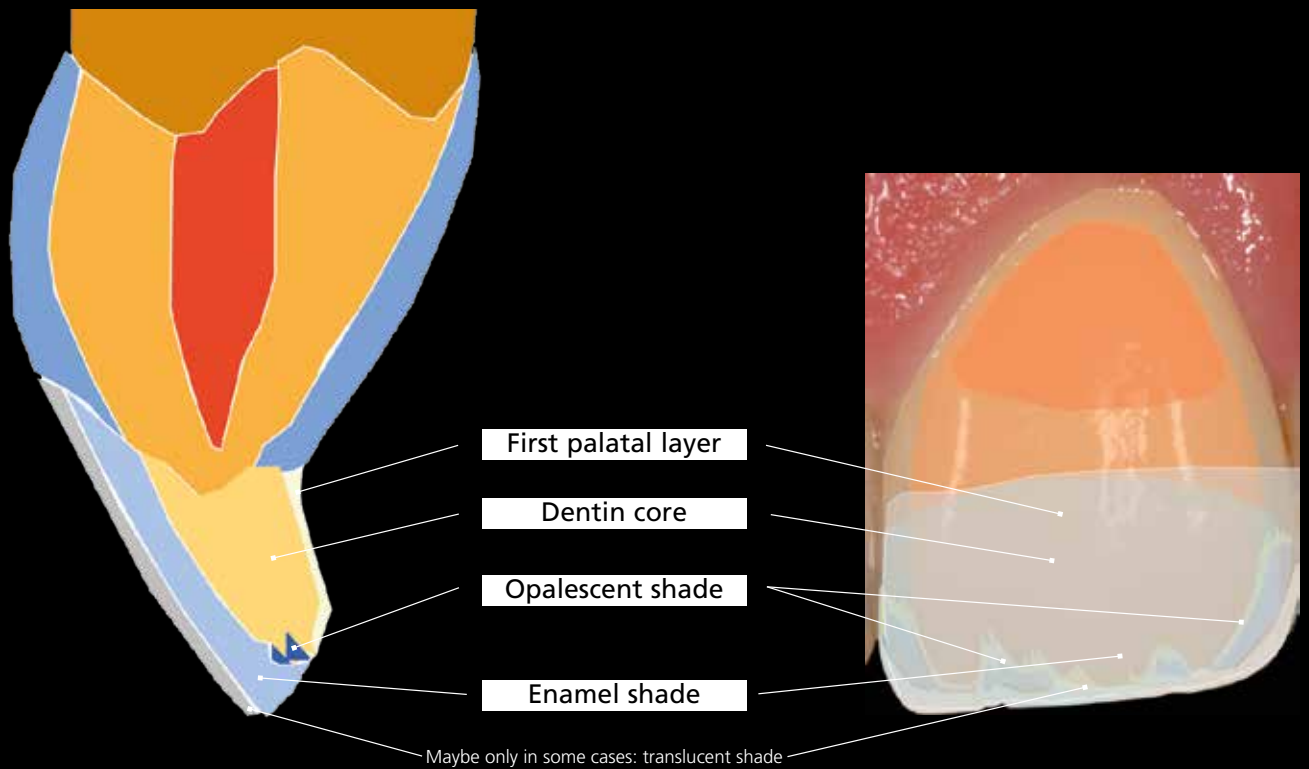
Anatomical layering is based on mimicking dentin and enamel in their original form and proportions. When enamel is carefully removed after 72 hours of immersion in a mildly acidic solution, the dentin core remains undamaged. The picture below shows the dentin structure at the incisal edge with delicate, small and irregular mamelons. These shapes are far from the typical bulky and coarse mamelons shown in some text books. This situation has to be recreated when layering anterior composites.



Teeth before and after the enamel was removed.



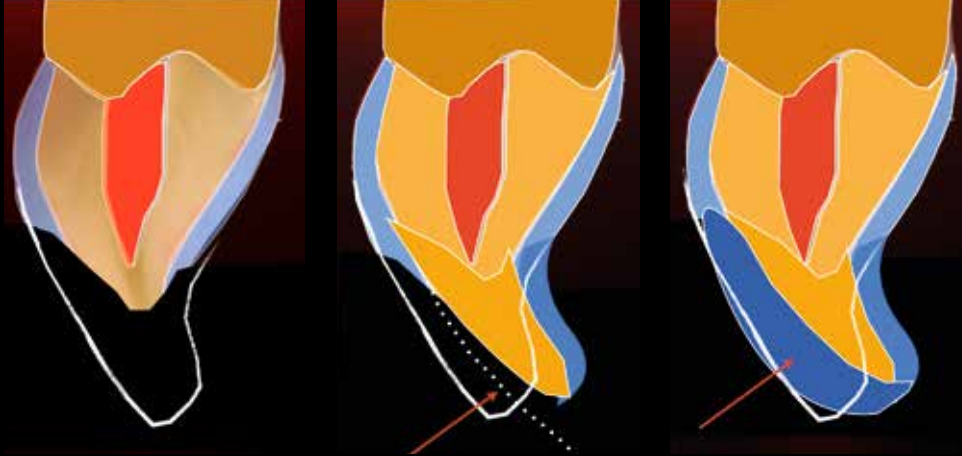
Teeth before and after the enamel was removed.



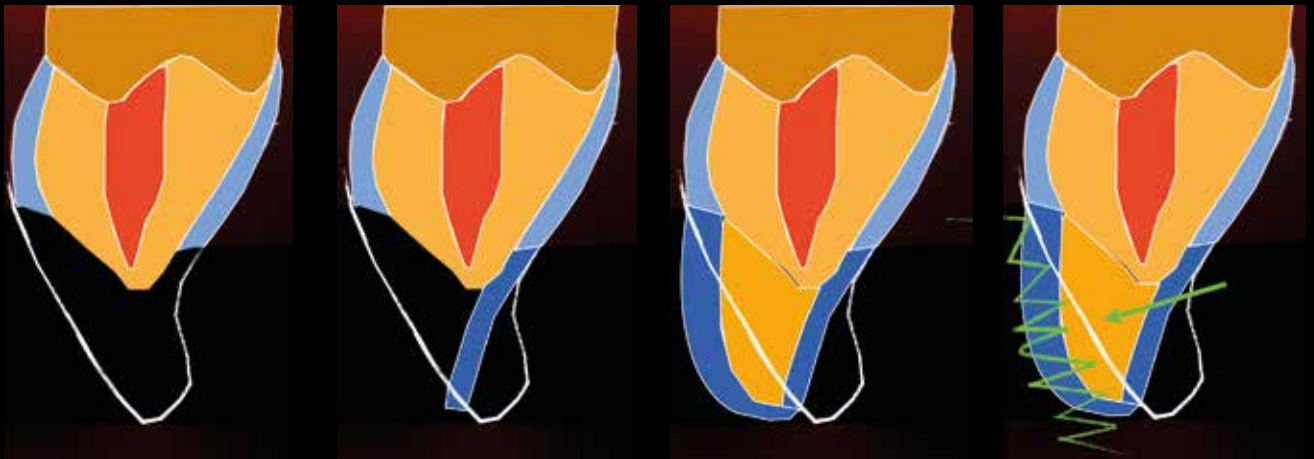
In general, for most of the cases, we will need a dentin shade to match the tooth opacity. We will have to cover this opaque layer with a more translucent enamel shade. In some cases we may need an effect material, usually an opalescent shade, which will go in between.



A silicone guide helps us to place the first layer of enamel in the proper position. This will help us to place the other layers in the right place as well.



If the position of the first layer is wrong (too palatal) the dentin layer will be located too palatal as a consequence. An excessively thick layer of enamel would be created to compensate, and this would produce regrettable esthetic results.



Another mistake would be to place the first layer too buccal, which would result in the dentin shade also being too buccal and the superficial layer of enamel in the wrong position. The outcome would be a restoration that is too thick. When the restoration is finished, the dentin layer would come to the surface with lamentable esthetic consequences and incorrect incisal guidance.

# Shade selection

Many composite systems provide not only many different shades, but also different levels of opacity.

Name	Company	Dentin	Body	Enamel	Translucent	Special Effects
IPS Empress Direct	Ivoclar Vivadent	13		16	3	7
Esthet X	Dentsply	7		19		5
Filtek Supreme Ultra/ Filtek Supreme XTE	3M/Espe	7	17	8	4	
Miris 2	Coltène	8		5		4
Amaris	Voco	6		3		2
Venus Diamond	Heraeus Kulzer	4		15		4
Enamel Plus HRi	Micerium	9		3		3

## Shades of IPS Empress Direct and the concept

### Shade guides

The shades guides are accurate and long lasting, because they are made of ceramic.

### Advantages

- Long-lasting ceramic shade tabs
- Autoclavable
- Accurate shade determination





### Shade range

The layering concept of IPS Empress Direct is extremely simple and logical. Many different dentin shades are provided to achieve just the right opacity. These materials are subsequently covered by more translucent and smoother enamel shades. In addition, three different translucent shades are offered for special effects.

### IPS Empress Direct – 32 shades

#### Opaque

#### Translucent

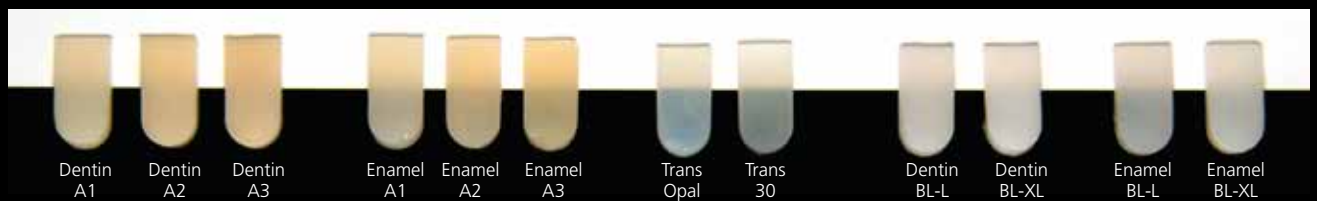
Opaque*	Dentin A2 1.5 mm	Enamel A2 2 mm	Trans 20	Trans 30	Trans Opal
0.5 mm					
<b>1%</b>	<b>7–8% **</b>	<b>13–15% **</b>	<b>20% **</b>	<b>30% **</b>	<b>45% **</b>
	<b>13 shades:</b> A1, A2, A3, A3.5, A4, IVA5, IVA6	<b>16 shades:</b> A1, A2, A3, A3.5, A4	<b>IPS Empress Direct Flow – 3 levels</b>		
	B1, B2	B1, B2, B3, B4	<b>Bleach XL 2 mm</b>	<b>Trans 30 2 mm</b>	<b>Opal 2 mm</b>
	C3	C1, C2, C3	<b>11–12% **</b>	<b>27–33% **</b>	<b>25–30% **</b>
	D2	D2, D3			
	Bleach L, XL	Bleach L, XL			

\* 20 s ≥ 1,000 mW/cm<sup>2</sup>

all other shades: 10 s ≥ 1,000 mW/cm<sup>2</sup>

\*\* Example value, Technical Datasheet, Ivoclar Vivadent AG

Consistent differences in shade and opacity, IPS Empress Direct



The shades are consistent in saturation and opacity. There are clear differences in opacity between the Dentin, Enamel and Effect materials. Furthermore, A3 is clearly more chromatic than A1 or A2.

Source: V. Brosch, Germany

# Adhesion



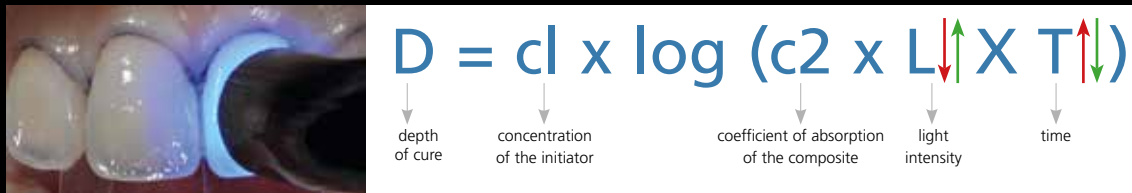
A durable and consistent adhesive layer is the foundation of any successful composite restoration. In order to bond composite to the tooth substrate, strict clinical adhesive protocols have to be observed. Over the years, many adhesives have been brought to the market to fulfil the challenging task of dental adhesion. Based on the classification published in 2005 [1], today's dental adhesives for bonding composites to the dental hard tissues can be described as in the picture. Excluding glass ionomers, there are basically two groups of composite adhesives: Etch&Rinse adhesives (which use mainly phosphoric acid as a hard dental tissue conditioner) and self-etch adhesives (which use self-etching primers as hard dental tissue conditioners). The choice of whether to use the former or the latter option depends on the clinical use and the advantages of the process itself. Nevertheless, recent studies confirm the importance of using phosphoric acid when enamel margins are present. When phosphoric acid is used, less discoloration at the restorative margin is observed compared to the results achieved with protocols involving other conditioning systems [2].

With the advent of new chemically modified functional monomers, a new family of adhesives has been developed: they are known as Universal Adhesives. Due to their new formulations they can be used as an Etch&Rinse bonding agent, or as a self-etch bonding agent. Some of these adhesives even bond to non-dental hard tissues. Special primers (like Monobond Plus) are required to help generate adhesion to zirconia, glass-ceramics and metal alloys. The advantage of these products is their versatility of use, allowing the clinician to modify his or her protocol depending on the clinical situation. Adhese® Universal represents one of these adhesives. It is available in two presentations: as a bottle and as a pen.



# Photopolymerization

## Logarithmic relationship between the curing depth (D), light intensity (L) and time (T)



The polymerization depth (D) is generally expressed by the formula shown. The factors  $c_1$  and  $c_2$  contain data regarding the concentration of the initiators and the absorption coefficients of the composite. A number of researchers have been able to prove the logarithmic relationship between the curing depth and the light intensity as well as between the curing depth and the exposure time shown in this formula. For the clinical practice, this formula shows that in cases where the light intensity is increased by a certain factor, the exposure time can be decreased by the same factor.

It would be ideal for dental practitioners, if they could take advantage of a curing protocol that can be applied universally in all cases. Koran and Kürschner concluded that if the total dose of light intensity (the product of light intensity and exposure time) delivered to the composite is higher than 17,000 mWs/cm<sup>2</sup>, the overall surface hardness tends to remain constant. This dose is achieved with a light intensity of 400 mW/cm<sup>2</sup> and an exposure time of 42.5 seconds (17,000 mWs/cm<sup>2</sup>: 400 mW/cm<sup>2</sup> = 42.5 sec). For example, an exposure time of 20 seconds requires a light intensity of 850 mW/cm<sup>2</sup>. This calculation is referred to as the "Total Energy Concept".

This investigation was done more than 15 years ago. Today, composites are more reactive and at high intensities less time is needed to cure them. In the particular case of IPS Empress Direct, each increment can be cured for 10 seconds with a high-power LED such as the Bluephase® Style.



Composites like IPS Empress Direct can be cured for 10 seconds with powerful lights such as Bluephase Style.

# Survival rate

It is generally accepted that Class III restorations perform better than Class IV or Class V restorations. Recent publications show a survival rate of over 90% for Class III restorations and close to 90% for Class IV (both after 10 years) and almost 85% for Class V restorations over a period of five years [3].

Bevelling of the restorations tends to improve the esthetic outcome but not the survival rate [4]. As shown in the pictures, overhangs can be lethal for the survival of restorations. It is also important to note that modern properly cured composites do not change colour over time. One of the reason for colour instability is improper polymerization due to insufficient energy from a defective light or a lazy curing technique performed by the clinician [5].



Old restorations

# Assessment

” I was fortunate enough to be involved in the development of IPS Empress Direct from the very early stages of this project, and I had the privilege of giving some input about our experiences with the concept.

Since that time, we have gained a lot of experience with the system, and I can only confirm our first impression of the concept: in other words, that it is easy to understand, predictable and user-friendly. Whenever we have done a course, the participants have been able to follow the ideas easily and transfer the theory into immediate improvements. Finally, as seen in some of the cases shown, the immediate positive results last for many years, which is an aspect that gives us much satisfaction with the work we do on a daily basis. ”



**Dr Eduardo Mahn**

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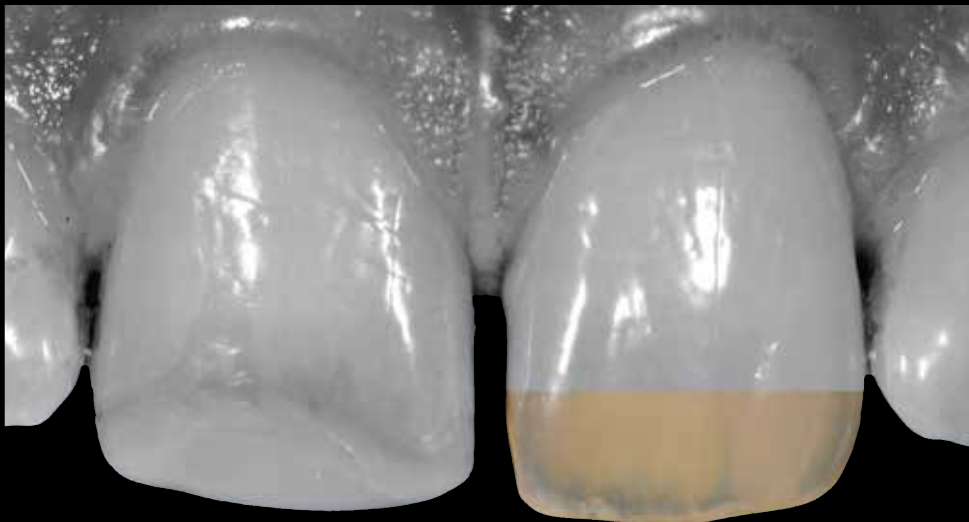


# Clinical Cases

## Case 1



Undesirable monochromatic Class IV in tooth 11



A black and white picture with a window with more exposure shows the opalescent areas.



A silicone guide was fabricated before removing the old composite.



The old composite was removed.



A smooth transition was created between the defect and the remaining tooth structure. Sharp edges were avoided.



Phosphoric acid was applied for 30 seconds.



ExcITE® was applied for 10 seconds.



The first composite layer was placed with the help of the silicone guide. IPS Empress Direct Enamel A2 was used.



View of the thin first palatal layer



The second layer was dentin shade A2. Some of the mamelons were created at this stage, before curing.



The composite was cured for 10 seconds with the Bluephase Style curing light, as it was the first enamel layer.



The IPS Empress Direct Opal shade was applied in small increments between the irregularities left on the dentin surface.



View after polymerization



A thin layer of IPS Empress Direct Enamel A2 was applied. At the end, a very thin layer of IPS Empress Direct Trans 30 was placed.



Finishing and polishing was performed with carbide burs and the Astropol rubber polishers.



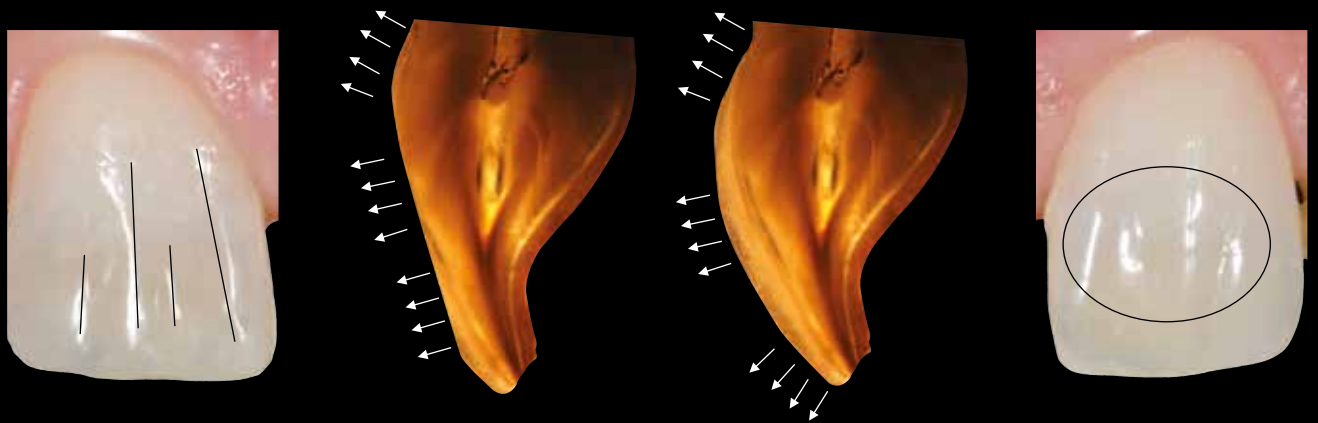
Finally, Astrobrush was used at very low speed in order to obtain the final lustre of the restoration.

Although the restoration looks presentable, we can improve a few aspects. The lines of reflection are different from those of the adjacent tooth, because the labial contour is also not the same. There is some bonding material in the distal area and the filling partially closes the diastema.

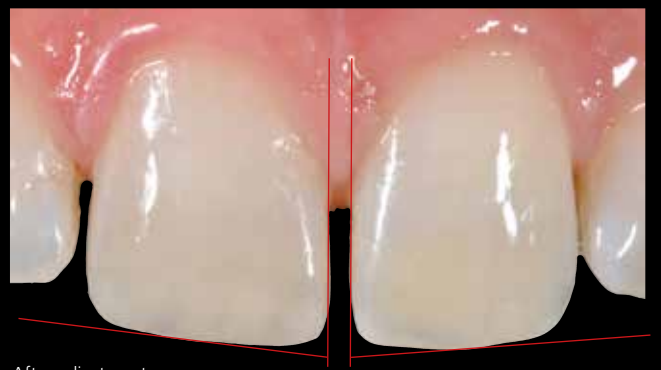


Side view

From the side view, the anterior teeth can be divided into three thirds, each one with its own inclination. When the adjacent tooth shows gloss only in the middle third, the other thirds will reflect light in other directions. In this particular case, either composite had to be added in the middle third, or some had to be removed from the incisal third. We chose the latter option.

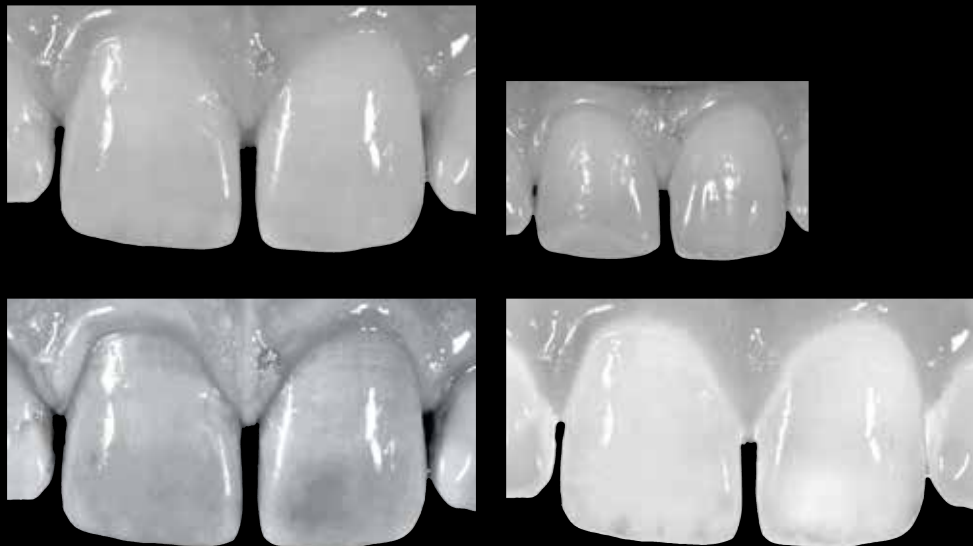


Before adjustment



After adjustment

The value of the restoration is extremely close to that of the natural tooth. This is the main reason for its smooth integration. It is important to note that opalescent areas are never the same on both central incisors. Therefore, we can make them similar, since it is unnecessary to make them the same. The differences can be visualized as shown in the pictures below.



Follow up. Although six years have passed, the restoration appears very similar to the way it looked on the first day.

## Case 2

Here we see a case in which Tetric EvoCeram® and IPS Empress Direct were combined. The esthetic result remained stable over seven years, with only minor wear. The patient is a 33 years old male who weighs 90 kg, which means he has really used his centrals over the past years.



Preoperative situation



One-week recall, February 2007  
Tetric EvoCeram Dentin and Enamel shades were used. Tetric EvoFlow A2 was also used for the contours, and finally IPS Empress Direct Enamel A2 was applied as the final layer.



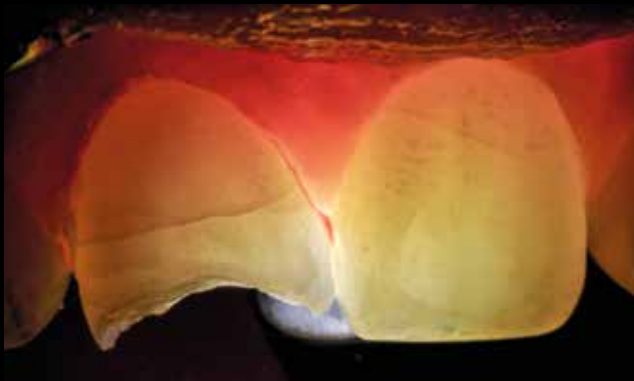
Seven-year recall, March 2014



## Case 3



In some cases, we have to provide emergency treatment for kids. A deep understanding of optical effects and how composites work can help us to master these types of cases, for example, a fracture without pulp exposure.



Transillumination with white light to see fractures in the enamel of the affected tooth and the adjacent one.



A bevel was created. Care was taken to produce a smooth transition to the composite without any sharp edges.



The tooth was etched, rinsed and dried. ExcITE F was applied as a bonding agent. The first layer of IPS Empress Direct Enamel B2 was then placed.



The dentin layer, shade B2 was placed.



After covering the entire dentin with Enamel B2, IPS Empress Direct Flow Bleach XL was applied generously and then cured.



The restoration was finished and polished.



The result immediately after the treatment



One week postoperative. The result might not be quite the same as the adjacent central, but with this simple protocol and thanks to the fantastic mimetic effect of IPS Empress Direct even emergency treatment can achieve pleasing results in kids.

## Case 4



Before.  
The mesial reflection line is wrong. Instead of creating a convex line, we produced a concave line, which looks unnatural.

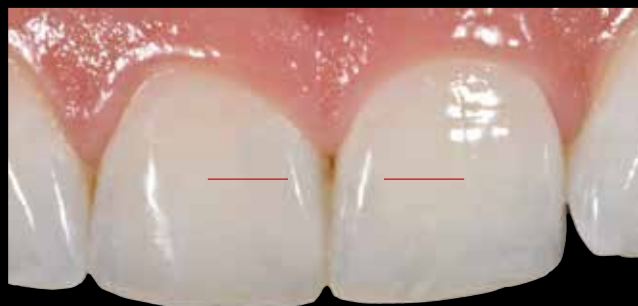


After.  
Shades Dentin A1, Enamel A1, Bleach XL and Trans Opal from IPS Empress Direct were used.

Thanks to the proper design of the reflection line and the natural integration of IPS Empress Direct it is almost impossible to identify the filling.



Before correction



After correction

## Case 5

Very often, we see unsatisfactory composite fillings that are not accompanied by caries. In some cases, they show several obvious mistakes that we can easily recognize from a frontal view. Some cases involve mistakes, which are visible, but need a deeper understanding of tooth anatomy. The pictures below show two composite fillings, which are clearly not ideal. However, just from the buccal perspective the mistakes are difficult to diagnose.



The 12 o'clock view clearly shows the lack of volume and contours. The pictures on the right side show the final result after correction of the mentioned mistakes. The appropriate volume and contours of the central incisor and the lateral make the restorations almost invisible.

Case courtesy of Gustavo Mahn

## Case 6

The rectification of some simple mistakes can dramatically improve the final appearance. Some clinicians will immediately change the restoration. Very often marginal staining occurs because of insufficient etching and later on due to the excessive extension of the composite.



The excess was removed and the incisal border and the embrasure were reshaped just by grinding. The little notch in 22 was filled with Enamel A1 from IPS Empress Direct.



## Diastema closure



Whenever we add composites to natural tooth structures we have to be extremely careful to avoid making any disastrous mistakes.



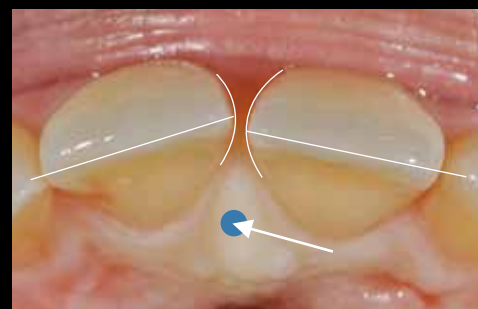
A fundamental problem ...  
the transition between the composite and the natural tooth in the cervical area

When diastemas are not closed properly, the medial papilla reacts and swells. Closing diastemas with silicone guides or free-handedly tends to create this problem, because the emergence profile is never the right one. In addition, it is difficult to remove the excess at the cervical margin and complex to polish the restoration.





# Case 7



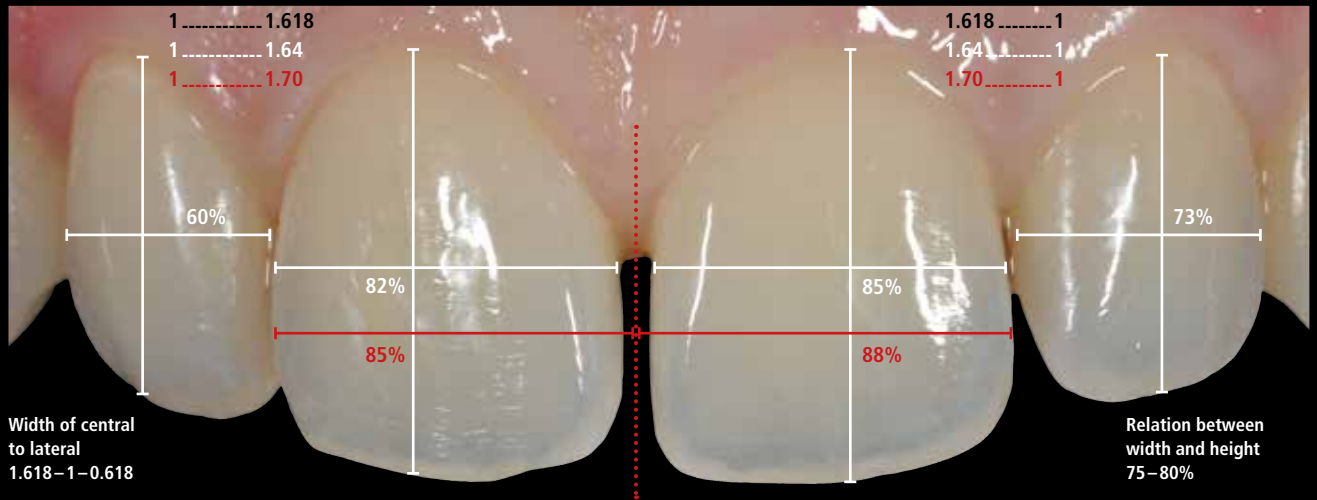
Minimal misalignment of the two centrals

Design of the restorations in order to evaluate the size and emergence profile



Halo and opalescent effects: We can either create a halo effect by adding some whitish composite (Enamel Bleach XL from IPS Empress Direct) or by leaving the incisal border with 45°.

### Golden proportion



One size was closer to the golden proportion. By closing the diastema the relationship between the two sides remained stable, since the space was distributed equally. It was far more important to consider the relationship between the width and height of both centrals. When the diastema was closed, the ratio was still in an acceptable range.



The technique is based on placing a mylar strip deep into the sulcus and holding it with the finger. It is placed after the application of the gingival cord.



The mylar strip held with the finger will produce an appropriate emergence profile. The flowable composite will achieve a feather edge transition at the cervical margin. Its self-adaptive characteristics make the procedure simple, fast and easy.



Finishing and polishing of the first side

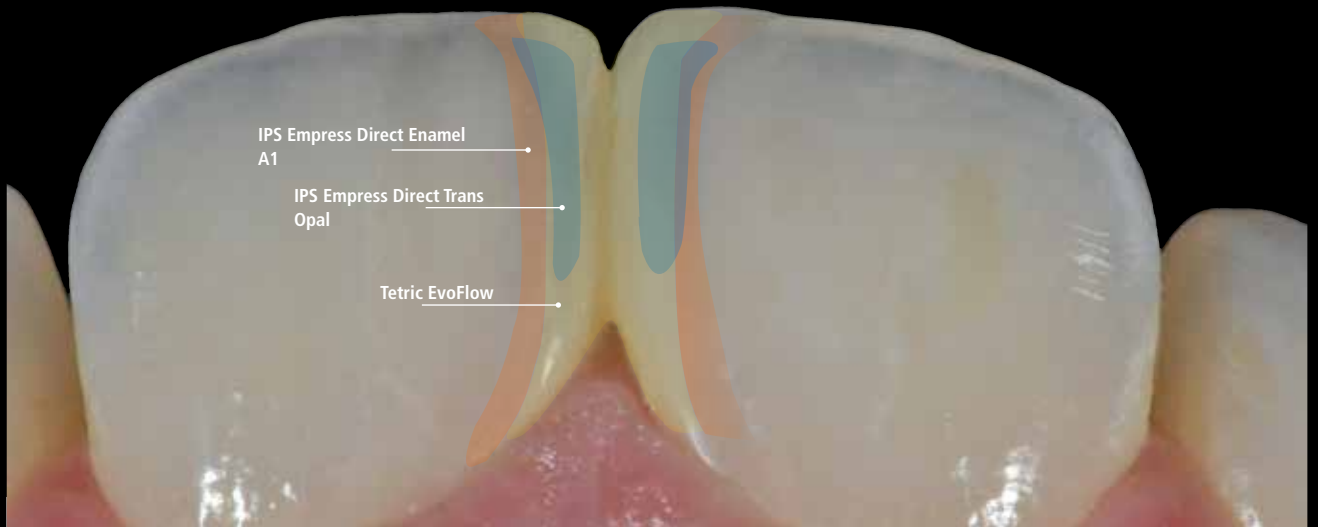


Then the other side and minor adjustments

Before and after



Analysis of the proportions: They remain within an acceptable range.



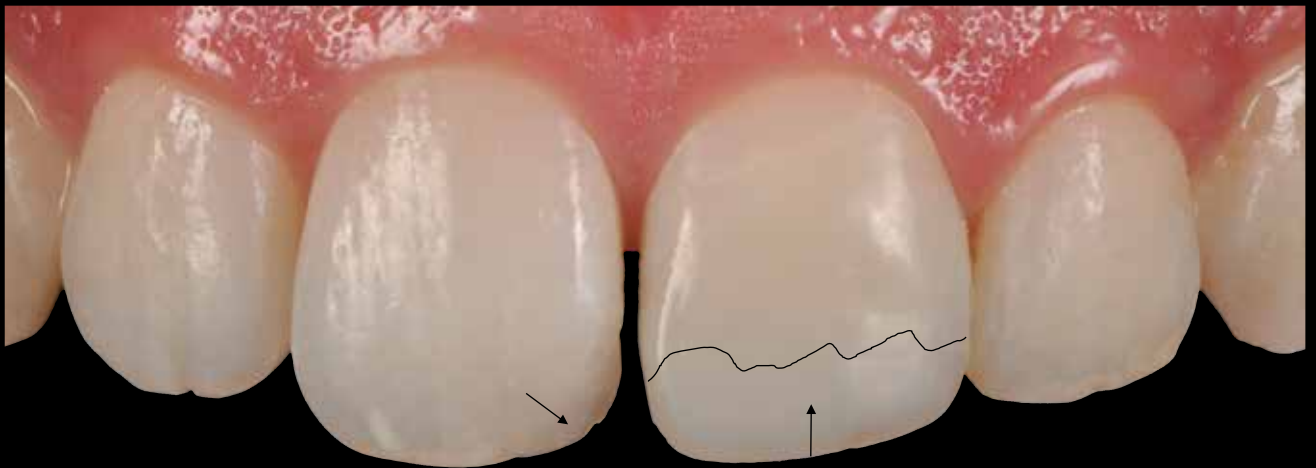
Restorations fabricated with IPS Empress Direct Enamel A1, Tetric EvoFlow A1 and Trans Opal shade from IPS Empress Direct Flow



A successful diastema closure needs proper planning and an enamel bonding agent, mylar strips, a flowable and an esthetic composite.



Preoperative situation. Unsatisfactory Class IV filling in tooth 11 and a Class IV with a small indent in the middle third



Detailed situation





After removing the old restoration, the diastema was closed with the help of a mylar strip and Tetric EvoFlow A2: Same technique as shown previously.



Immediate integration of the fillings



Before



After



Extraoral view



## Literature

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- [2] Heintze S.D., Rousson V., Clinical effectiveness of direct Class II restorations – A meta-analysis, *J Adhes Dent* 2012;14:407-431.
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- [5] Mahn E., Clinical criteria for the successful curing of composite materials, *Rev. Clin. Periodontol. Implantol. Rehabil. Oral Vol.* 6(3);148-153, 2013

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