Excellence in Dental Esthetics

Implantology Master Class New Trends and Materials in Esthetic Implantology

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Key words: implant prosthesis, CAD-CAM planning of the structure, planning of stems, pink esthetics, emerging profile, esthetics, gingival ceramic, esthetic coating ceramic, ceramic for microfine structure, surface, texture, optics.

The underlying aim of the new concept presented in this article is clear : the principles of facial harmony currently determine the dentist's work and have totally changed the dentist's understanding of esthetics. A tooth's esthetics is no longer considered in isolation for the dentist is above all dedicated to harmonizing the dental rehabilitation with the person. Esthetics and function have to form a unifying vision.

Metal-free restorations have been increasing in importance and modern CAD/CAM technologies guarantee quality and constant precision of the metal-free structures. Dentists are now used to having a monitor at work and CAD planning of all ceramic structures has now become part of the dentist's daily routine. Most structures used for all ceramic bridges are made of zirconium dioxide. The loss of vertical substance in implant prostheses has long been compensated for by using teeth of a very long length. In contrast, the new standard is composed of gingival ceramic.

The vision is one of esthetic implantology focussed on the future. The aim is to obtain an excellent final result using a rational and structured method of correctly choosing ceramic masses in agreement with the motto "time is money".

Changed paradigms

Odontotechnical restorations must be made with a love for detail while simultaneously not losing sight of the whole. The esthetic is both pink and white, and in addition to the esthetic, the patient also needs functional well-being.

Changing of the guard for systems and materials

Ceramic, and especially all ceramic, is the material of the future. Zirconium oxide has largely replaced dental alloys. The traditional methods are giving way to innovative CAD/CAM technology. The dental technician works with new systems but maintains tried and tested underlying basic principles.

The constant factors

Precision, esthetics, and function still form the essentials of prosthetic dentistry. The ambitious dental technician works ergonomically, with precision, is faithful to the natural model, enjoys working in a team spirit, and is always guided by professional ethics and the final result. Today dental techniques not only involve craftsmanship but also form the profession of prosthetics within dentistry. In spite of a certain amount of scepticism, introductory considerations of zirconium oxide show that the growing success of all ceramic systems is due to their convincing esthetics, biocompatibility, and the long life of the restorations. Zirconium dioxide is one of the hardest wearing dental ceramic materials and possesses excellent mechanical characteristics. It provides the dental technician with extraordinary opportunities to produce all ceramic rehabilitations. Zirconium dioxide opens numerous doors in esthetic dentistry. On the basis of the two models, characterized by two frontal implants and a gingival defect, the possibility of applying all ceramic structural materials having a coefficient of expansion of 8.8 – 9.2 when Vita VM9 veneering ceramic is used can be analyzed.

There must be feeling between the dental technician and the ceramic masses, but what is the selection criterion? Generally speaking the ceramic masses must allow nature to be copied simply, easily, and smoothly. If the ceramist concentrates on the essentials, perfect stratification can result from using only a little mass. Carrying out complicated stratifications using numerous masses with different effects is pointless if they cannot be seen after the firing. It is essential in modern dentistry to obtain the best result from a contained effort.

Fig. 1: Initial situation

Fig. 2: The implant in position 21 has been positioned with a labial inclination that from the dental technician's point of view is slightly unfavourable

Figs. 3 and 4: Wax-up

How to meet the requirements for functionality, periodontal hygiene, phonetics, and last but not least, esthetics is now explained.

Initial situation

Most restorations made by the authors are partially or fully supported by implants. This model is based on a real situation, recognizable as such by any dental technician, whether expert or not. Two implants were inserted in the frontal group 21-23. A zirconium dioxide bridge needs to be made and screwed on the implants by considering the implantological criteria now considered to be essential. The initial situation (Fig. 1) was not the best for a satisfactory esthetic result to be obtained so two different solutions were proposed, both functionally and esthetically acceptable. The implant in position 21 was positioned with a labial inclination that is slightly unfavourable from the dental technician's point of view (Fig. 2).

Technical procedure

The planning and production of the definitive restoration firstly involved the preparation of a wax-up (Figs. 3 and 4). This wax-up is based on parameters such as the length to width ratio of the natural teeth while always taking the functional aspects into consideration. The silicone mask (Fig. 5) of the wax-up is used as a reference and means that whether or not the size is correct can be checked at any time during the course of each phase.

Therefore, the structures are modelled in resin according to the form of the teeth desired (Figs. 6 and 7). A zirconium dioxide bridge that is an exact copy of the resin structure is obtained by scanning it on a Procera Forte scanner.

The passivity of the two implants is immediately convincing. The crowns' borders are precise. The position of the intermediate element, thickness, and connection of the connectors correspond exactly to the computerized planning (Figs. 8 and 9).

The silicone mask is also indispensable in this phase because the all ceramic structure must be exactly the right size so as to avoid any detachment of the ceramic veneer in the future (Fig. 10). In order to obtain an acceptable esthetic result, the zirconium dioxide structure of element 21 must be made as finely as possible.

Figure 11 shows the extremely natural semi-translucence of the zirconium dioxide structure. The preliminary thermal treatment (regeneration firing) of the zirconium dioxide structure in the ceramic firing oven at 1000°C-1150°C. without vacuum, maintained for 15 minutes,

guarantees the bonding of the all ceramic structure and the veneering ceramic.

The Dentin Base mass or alternatively Effect Chroma, Chroma Plus, or Effect Liner for the wash firing (Fig. 12) must be applied according to the instructions so that excellent wetting of the surface is guaranteed. In order for this ceramic layer to fuse correctly, a temperature of 950°C-960°C needs to be used.

So as to avoid residual thermal tension in the veneering ceramic, and particularly in the case of a job with a large

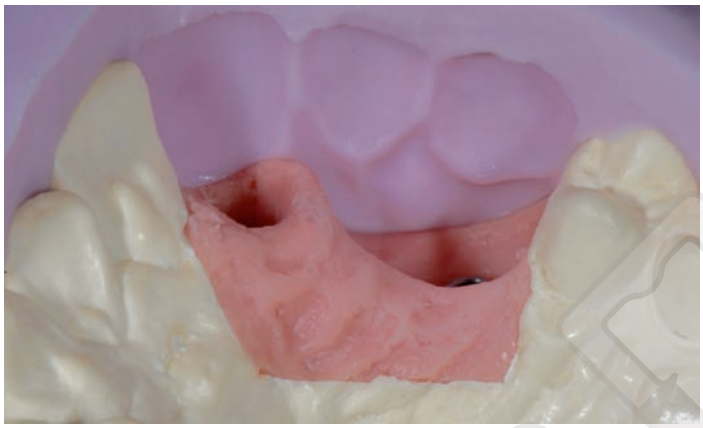
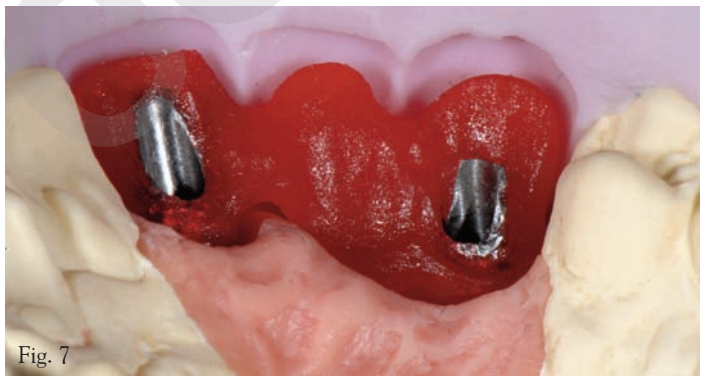
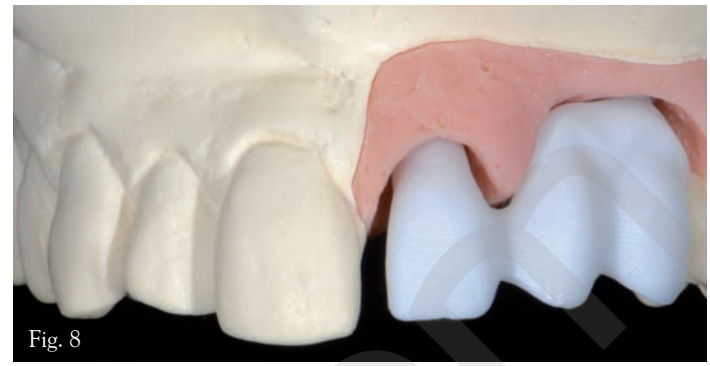
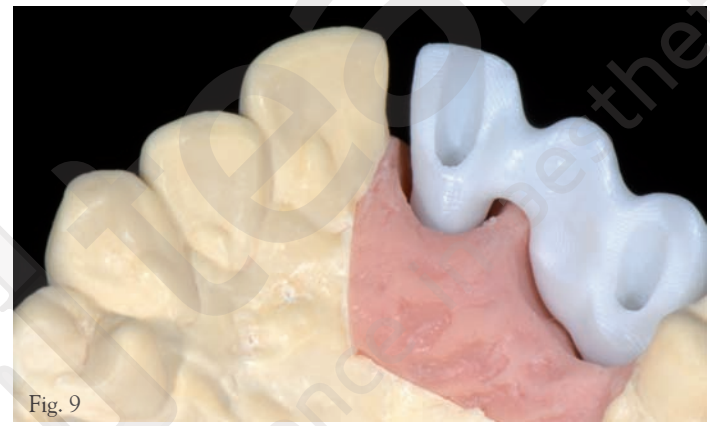


Fig. 5: Silicone mask



Figs. 6 and 7: Resin modelling





Figs. 8 and 9: The zirconia bridge

Fig. 10: The importance of the silicone mask during the process of making the entire ceramic structure

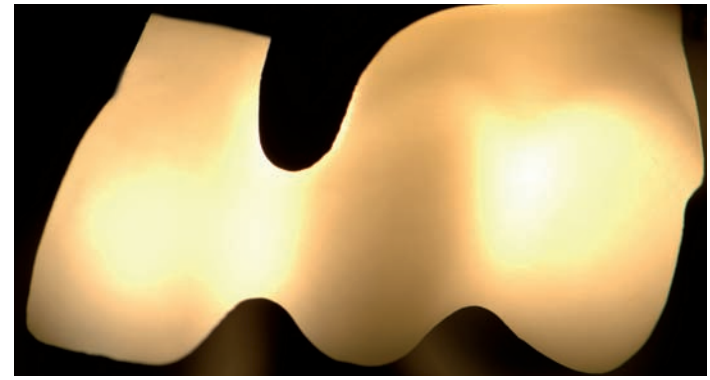


Fig. 11: Natural semi-translucence of the zirconium dioxide structure

Fig. 12: Wash firing

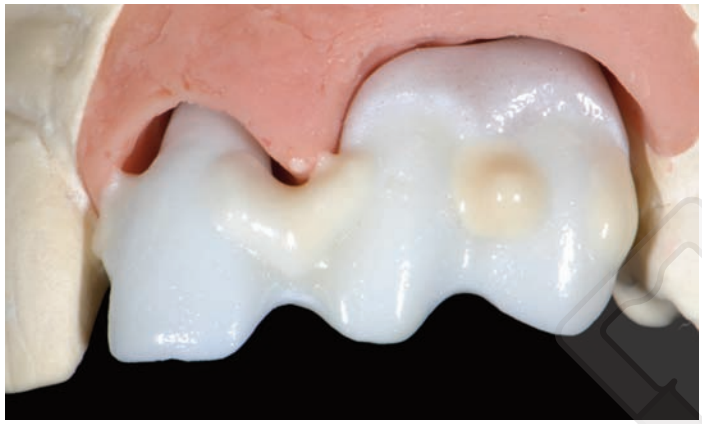


Fig. 13: Application of the Chroma Effect 4 and Chroma Effect 4-6 masses

Fig. 14: The Dentin Base mass confers a higher degree of chromatic saturation to the cervical area

Fig. 15: Modelling in an anatomically reduced form using 1M2 Dentin Base for the central, 3M2 for the lateral, and 4M2 for the canine

Fig. 16: Prepreparation of a transversal area ready for the application

Fig. 17: The transversal area is clearer in the central incisor

Fig. 18

Fig. 19

Figs. 18 and 19: Incisal and interdental reduction

Fig. 20: Stratification of the incisor plate

Fig. 21: Details for a successful restoration

Fig. 22: The ceramist may give free rein to his or her own creativity: colors, positions, and sizes may be more varied

Fig. 23: The mamelons determine the character of the crown and contribute to the success of the restoration

mass, both a slow pre-drying and gradual cooling down to a lower temperature than that of ceramic transformation is recommended (approx. 600°C in the case of Vita VM9).

The thermal conductivity of zirconium dioxide during firing is less than that of a metallic structure. Not using suitable settings for the firing in this phase can cause the later formation of fissures and eventual detachment of material.

Stratification for the first firing

In this case a 1:1 ratio of Effect Chroma 4 (Lemon Drop) and Effect Chroma 4-6 (Lemon Drop/Sunflower) mass was applied between lateral and canine in order to obtain a color more saturated in depth (Fig. 13).

In order to increase chromatic saturation in the cervical area, Dentin Base mass was applied in the cervical area resulting in the correct chromatic intensity: color 3M2 and 3M3 on the two incisors, and 4M3 on the canine (Fig.14).

Then the entire surface is modelled in an anatomically reduced form by using 1M2 Dentin Base for the central, 3M2 for the lateral, and 4M2 for the canine (Fig. 15). The real and proper color is in the center of the tooth. The anatomical form is completed using Transpa Dentine masses.

A clearer transversal area was created in the central incisor by mixing Transpa Dentine 1M1 with a pinhead of Interno 1 (White smoke) (Figs. 16 and 17).

After the anatomical form has been completed, the incisal and interdental reduction is carried out in an absolutely irregular manner (Figs. 18 and 19). ENL (Enamel Light) and EE9 (Water Drop) were used in a 1:1 ratio to stratify the incisal plate (Fig. 20). Consequently, it is possible to individualize an increase in the degree of translucency in the incisal margin.

The ceramist can give free rein to his or her creativity when applying the mamelons on the incisor plate: colors, positions, and sizes may be more varied. The mamelons determine the character of the crown and contribute to the success of the restoration (Figs. 21 to 23). Following this, the firing is deliberately carried out without applying transparent masses on the surfaces, which is done in the second firing.

Second firing

After the first firing (Figs. 24 and 25), the stratified details such as the mamelons are clearly visible. They certainly look too intense with too much chroma to the untrained eye because no masses conferring a natural depth to the incisal area are available at the moment.

Fig. 24: The stratified details are already visible after the first firing

Fig. 25: Bridge ready for the second firing

Fig. 26: The gingival ceramic is largely chromatized and can be desaturated or made more translucent by mixing WIN (Window) with it

Fig. 27: A toothbrush with worn bristles can be used to give the gingiva the orange peel effect

The effect of three dimensional depth obtained using WIN (Window) transparent mass is only apparent after the second firing. The incisal characteristics are inserted in a sandwich between the transparent and enamel masses. The bridge is adjusted to the model and made ready for the second firing.

Gingival ceramic

The zirconium dioxide structure is configured so that it will support the gingival ceramic. Mass G3 was used to imitate the small gingival defects. The papillae are modelled in a clearer pink color, a 1:1 ratio of G1+G2, so that the reproduction of the gingiva appears to be healthier, natural, and vital.

Interdentally the natural gingiva are less tense, wet better with blood, and tend to be slightly red. Moreover, G4 is applied in this area to imitate nature as much as possible. If the stratification is precise, then hardly any finishing is required (Fig. 25).

It is better not to mill the passage from the gingival ceramic to the crown. If the stratification is precise, then less milling is required. The gingival ceramic is largely chromatized and can be desaturated or made more translucent by mixing WIN (Window) with it (Fig. 26). The more the Window mass (transparent) used, the less the saturation. When the gingival ceramic is dry, the orange peel surface of the natural gingiva can be imitated. A toothbrush with worn bristles can be used to do this (Fig. 27) by etching the surface carefully using the bristles. Effect Chroma is used on the palatal side. These are modifying masses of an intense color to highlight determined areas chromaticized e.g. the cervical or palatal-lingual areas, which in practice can be used everywhere. In this case a 1:1 ratio of EC 4 (Lemon Drop) and EC 4/EC 6 (Lemon Drop / Sunflower) was applied on the frontals and so a veil of enamel and dentin was drawn over it. Following the firing, note that the form of the bridge on the implants (Fig. 28) is correct and a minimum of finishing is required. Clearly, the gingiva surrounds the teeth like a collar.

Finishing and surface texture

During the making of bridges and crowns, the details of the texture are reproduced in a specific sequence (Fig. 29). This is an important phase in the process that must not be neglected. The macrostructure is composed of lobes that subdivide the coronal surface into concave and convex areas. These vertical characteristics (Fig. 30) are applied to the coronal surface by using a diamond burr.

On the other hand, the microstructure is composed of small horizontally trending grooves, which are particularly

Fig. 28: Provided that the stratification is precise, finishing is not necessary

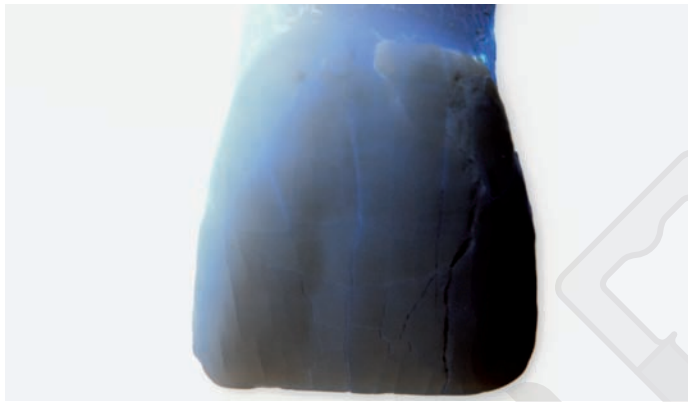
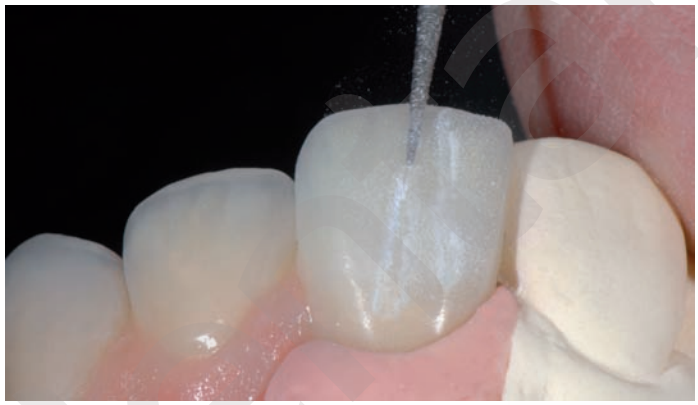


Fig. 29: The details of the texture are reproduced in a specific sequence



Figs. 30 and 31: The vertical characteristics are reproduced using a diamond-tipped drill/burr

Figs. 32 and 33: In order to optimize the surface morphology, the ceramics are pre-polished using a rubber

evident in young patients and that generally diminish with age. The horizontal growth lines are the last thing to be reproduced (Fig. 31). To improve the surface morphology, the marginal strips, the lobes, and the grooves are prepolished using a rubber (Figs. 32 and 33). The incisal margins and also the abrasion facets must have sharp cutting edges, be mirror polished, and homogenous (Fig. 34).

The homogeneity of the restoration is very important. The results of polishing and finishing microfine structure ceramic such as Vita VM9 are excellent. Perfectly smooth and compact surfaces are produced. The deposition of plaque is minimized, helping the hygiene of a high value ceramic rehabilitation. In this particular case glazing was not applied because the authors still polish manually after the final firing. Opinion nowadays is divided as to whether or not mechanical polishing guarantees a better esthetic appearance. Gold dust makes the invisible visible. The restoration is even more natural if the surface texture is copied right down to the smallest detail (Figs. 35 and 36). Even though the space was limited, the incisor is in line with the dental arch after the final firing (Figs. 37 to 39).

The incisal stratification is the most visible part of the tooth when the patient is talking or smiling. This is a reason for fully concentrating on the incisal third (Fig. 40).

Fig. 34: The incisal margins and also the abrasion facets must have sharp cutting edges, be mirror polished, and homogenous

Fig. 35

Figs. 35 and 36: If the surface texture is copied right down to the smallest detail, the restoration is even more natural

Fig. 37

Fig. 38

Figs. 37 to 39: Even though the space was limited, the incisor is in line with the dental arch following the final firing

Fig. 39

Fig. 40: The incisal stratification is the most visible part of the tooth

Fig. 41: The small palatal or interdental features and characteristics can be reproduced by using the colors in the Akzent assortment

Small peculiarties make the tooth lifelike, and the enamel masses guarantee the effect of depth. The small palatal or interdental features can be reproduced using the colors in the Akzent assortment (Fig. 41). Above all, the 'Fumo' colors are particularly suitable for the palatal and/or occlusal surfaces, positioned precisely, but in contrast to the other masses in this assortment, they are not florescent.

Same situation, different solution

This work presented in this article focussed on the esthetic needs of the patient, which were met. Inspecting the wax-up (Fig. 42) revealed the implants had an unesthetic situation and axial direction. However, the patient needs excellent esthetics. In this case the access to the screws will correspond to the incisal border, an impractical functional and esthetic situation (Fig. 43). A sequence of operational phases is established in esthetic implantology. The wax-up is made from the silicone mask, and serves in the checking of each operational phase in order to preserve a vision of the whole at all times (Fig. 44). This avoids unpleasant surprises: The silicone mask guarantees the rational application of the restoration.

Fig. 42: Inspecting the wax-up revealed the implants had an unesthetic situation and axial direction

Fig. 43: In this case the access to the screws will correspond to the incisal border

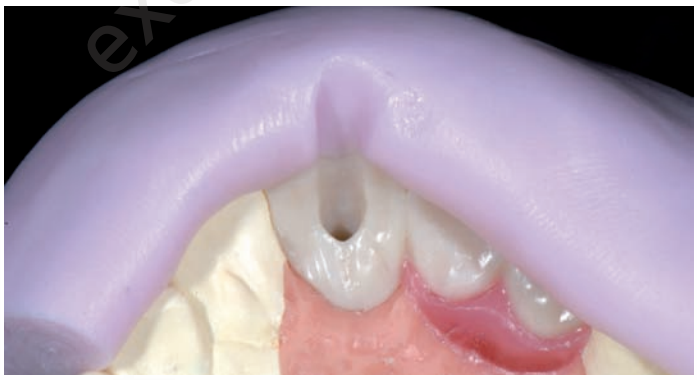


Fig. 44: The silicone mask guarantees the rational application of the restoration

Fig. 45: Correction of the implant's angle of inclination by milling

Fig. 46

Fig. 47

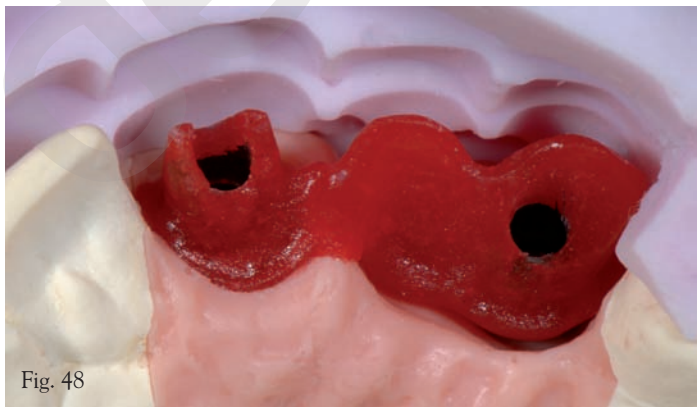


Fig. 48

Figs. 46 to 48: Checking the resin model with the help of the mask

Configuration of the structure

The labial inclination of the implant provided the germ for the innovative ideas and alternative solutions applied in order to resolve what was initially an unfavourable situation. In this case the implant's angle of inclination was corrected by milling (Fig. 45). The clear divergence between the angle of the guide post and the stem is corrected by milling. The modelling of the resin bridge can only be sized correctly with the help of the silicone mask (Figs. 46 and 47). To check the size of the bridge modeled in resin more accurately, the rim was cut at two points: in the centre of the tooth and cervically. The rim is pushed away using the thumb (Fig. 48) resulting in an excellent view during checking. Once the zirconium dioxide bridge has been milled on the basis of the scan (Figs. 49 and 50), the second phase of the project is begun.

A zirconium dioxide coping on the modified stem in position 21 is scanned. The stem is duplicated and this duplicated stem is scanned so that it can then be checked (Fig. 51). The inclination was adjusted to that of the surrounding natural teeth with the help of this individualized stem.

The zirconium dioxide coping restores a normal situation (Figs. 52 and 53), and the zirconium dioxide bridge is checked in the silicone mask (Fig. 54). Zirconium dioxide is less translucent than aluminum: 46% (Fig. 55) compared to 72%, but this is an irrelevant difference considering that the degree of translucence of metal is zero.

But translucence is only one aspect in the complicated puzzle of natural teeth. Durability is a very important concept that is often detrimental to achieving top quality esthetics.

If no compromises need to be made and the material is the right one, durability is also guaranteed. There are practically no descriptions in the literature on how to treat the subgingival parts of a zirconium dioxide superstructure. The choices are : no treatment at all, sandblasting, or mirror polishing. During the course of this work, Dr. Inãki Gamborena wanted the stems to be mirror polished.

This procedure has now become standard in the author's laboratory. Untreated surfaces on the zirconium dioxide structure are illustrated in figures 56 and 57. Low velocity mechanical prepolishing using a rubber is carried out until the surface is perfectly smooth. Karat diamond polishing paste is used for the mirror polishing (Figs. 58 and 59).

The space between the basal surface and the gingival tissue is hermetically sealed, which prevents food debris from getting trapped. Thanks to the high degree of homogeneity of zirconium dioxide and its mirror


Fig. 49

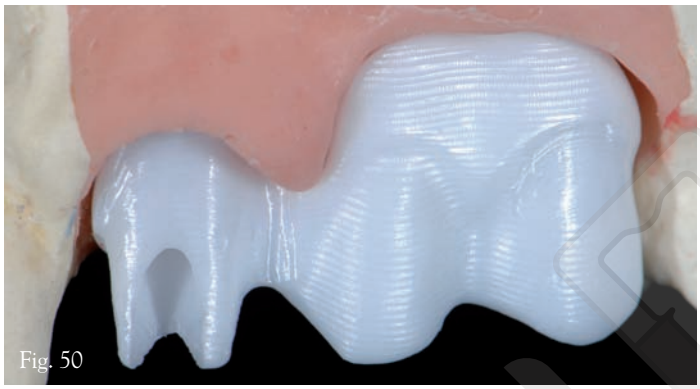


Fig. 50

Figs. 49 and 50: The zirconium dioxide bridge milled on the basis of the scan


Fig. 51: Scan to check the duplicated stem


Fig. 52


Fig. 53

Figs. 52 and 53: The individualized stem helps to adapt the inclination to that of the surrounding natural teeth


Fig. 54: Checking the zirconium dioxide bridge in the silicone mask

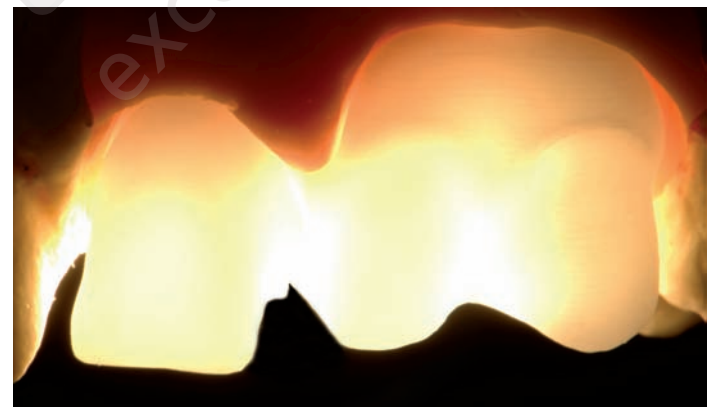


Fig. 55: Zirconium dioxide is less translucent than aluminum

polishing, the patient is able to clean the basal surfaces using silk dental floss, which simplifies the hygiene procedure.

As seen in ultraviolet light, all ceramics such as aluminum oxide or zirconium dioxide are not florescent (Fig. 60). The zirconium dioxide structure produces a dark shadow whereas the objective when using all ceramics is to avoid the formation of dark shadows.

The zirconium dioxide structure can be lightened using the highly florescent Effect Liner masses (EL 2 Cream –

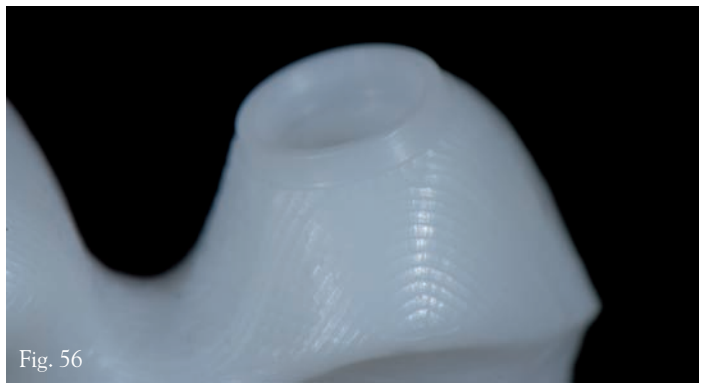


Fig. 56

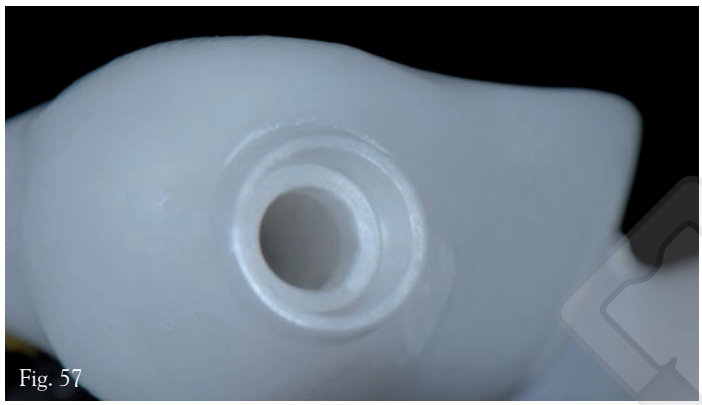


Fig. 57

Figs. 56 and 57: Untreated surfaces on the zirconium dioxide structure

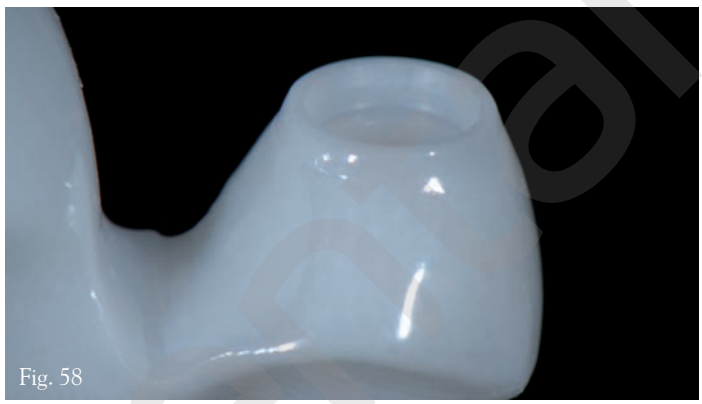


Fig. 58


Fig. 59

Figs. 58 and 59: Karat diamond polishing paste is used for the mirror polishing

beige in the frontals and EL 4 Golden Fleece – yellow in the canine) (Fig. 61).

As in nature, a high degree of luminosity is required to obtain a restoration with a vital appearance.

As already described in the first case, these masses bond the zirconium dioxide to the veneering ceramic. A layer of Gingival mass is also applied on the gingival defect for the wash firing (Fig. 62). In reflective light is not possible to see (Fig. 63) to what extent the rehabilitation needs a high degree of luminosity in order to obtain a vital appearance. The formation of shadow in ceramic prostheses must be avoided as far as possible. The Liner mass directs the fluorescence which in turn favors the distribution of the light (Figs. 64 and 65).

Stratification of the ceramic for the first firing

Once the wash firing to obtain the bond has been completed, the stratification can be started (Figs 66 to 68). The ceramic is a little shiny due to the high temperature of this firing, but all the same this is the required appearance. This is begun using Base Dentine of the desired color, and this is a saturation mass (Fig. 69). The

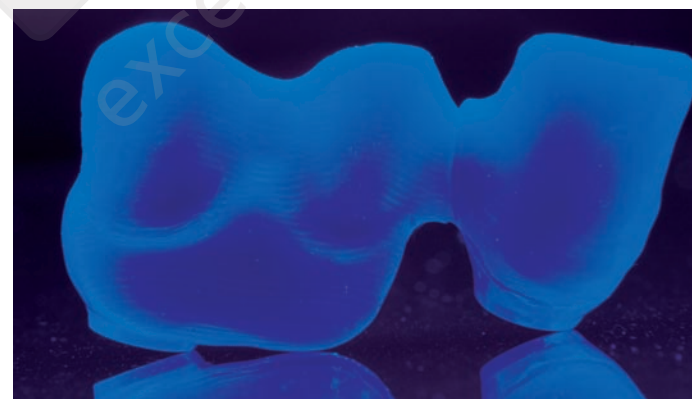


Fig. 60: The bridge in ultraviolet light

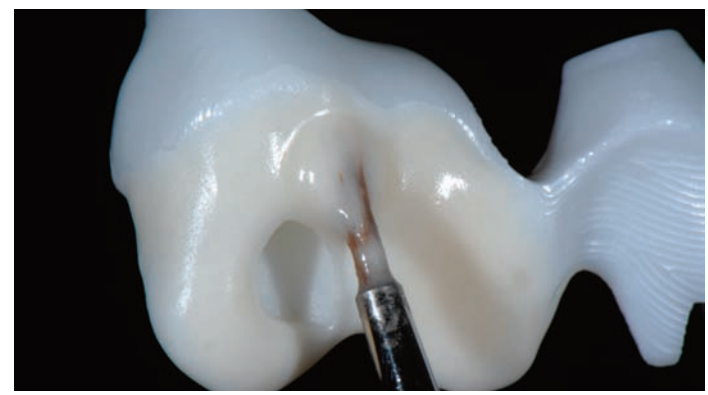


Fig. 61: Application of highly fluorescent masses

Fig. 62: A layer of Gingiva mass is applied

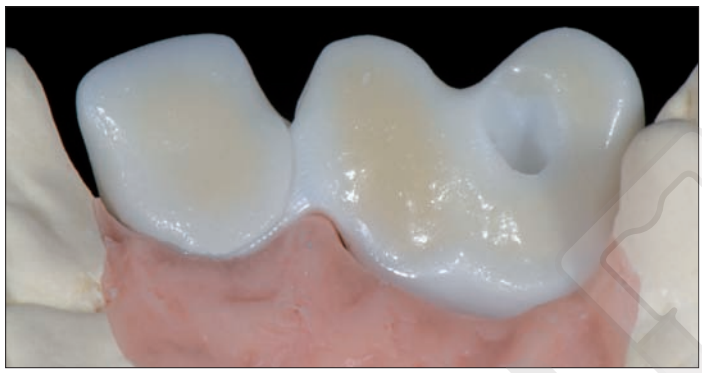


Fig. 63: In order for a rehabilitation to have a vital appearance, it needs a high degree of luminosity

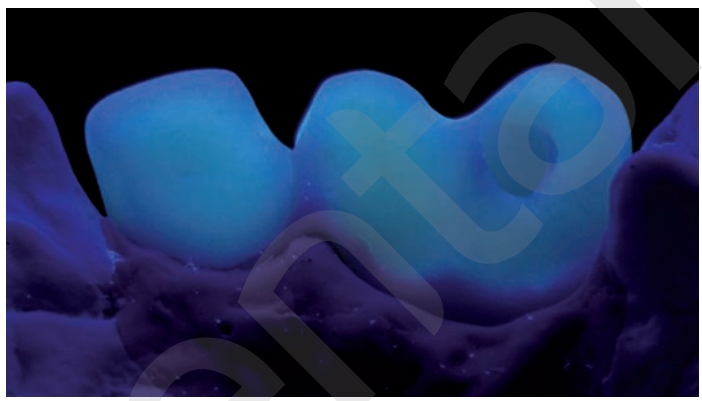


Fig. 64: The fluorescence favours the distribution of light

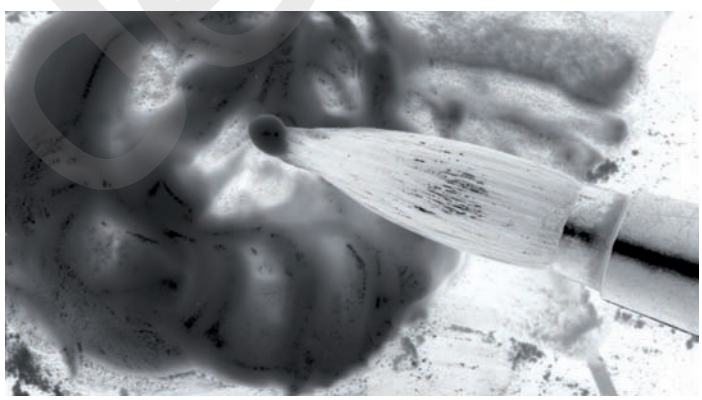


Fig. 65: The Liner mass guides the fluorescence which in turn favors distribution of the light

Fig. 66: The bridge ready for stratification

Fig. 67

Fig. 68

Figs. 67 and 68: Stratification

Fig. 69: Application of Base Dentine…

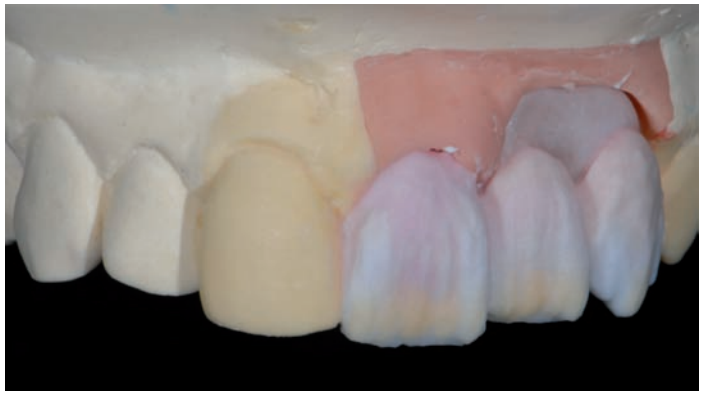


Fig. 70: ... and Transpa Dentine

Fig. 71: Reduction of the incisal and interdental level in order to facilitate the successive stratification

Fig. 72: EN L (Enamel Light) and EO 3 (Effect Opal blu) are mixed in a 1:1 ratio for the incisor plate The length of the incisal area must be slightly oversized

Fig. 73: Application of Interno 4 (Sunflower)

anatomical form is then completed using Transpa Dentine (Fig. 70). Having modeled the correct anatomical form, the bridge is incisally and interdentally reduced in an irregular way ready for the stratification to follow (Fig. 71). The "incisal vivacity" is created in this stage by mixing a 1:1 ratio of EN L (Enamel Light) and EO 3 (Effect Opal blu) for the incisor plate (Fig. 72). This clear blue color can be used in young patients as the base for mamelons. The length of the incisal area must be slightly oversized compared to the neighbouring teeth in order to compensate for the retraction that occurs during the firing of the ceramic (Fig. 72).

The anterior crowns are now characterized. To make the mamelons, Interno mass of an appropriate color is mixed with WIN mass (Window-transparent). Highly flourescent, intensely chromatic masses of a fine granulometry whose properties mix together are used for the internal surfaces. The assortment is composed of 12 colors that can be used with all the Vita VM masses. These features are also very florescent in nature. The dentin of the natural tooth is 30% organic and 70% inorganic. The organic particles are responsible for the fluorescence.

Being able to choose the color (including mixing it individually) is not only advantageous but also guides the degree of saturation: mixing more Internal mass with Window results in greater saturation while more Window decreases the saturation. If there is less space slightly increasing the saturation, an extremely thin layer can be applied or forced to penetrate.

In order to make the mesial and distal mamelons in this case, a 1:1 mixture of Interno 1 (White Smoke) and Interno 2 (Sand) was added to Window. A very small minimum amount of Interno 4 (Sunflower) was tamponed on the incisal plate of the central mamelons (Fig. 73).

On the palatal side (not visible) EC 3 (clear yellow Effect Chroma Pale Banana) was used for two incisors and EC 5 (clear orange Golden Rod) for the canine. The result of the first firing (Fig. 74) is very important because the achievement or otherwise of what was required can be checked.

Chromatic effects are clearly visible in the incisal area (imitation of the mamelons using Window and Interno). All that the dental technician has applied with the greatest of care must be recognisable. Should the opposite be the case, then it has been a waste of time because too much mass has been used, all to no purpose. So the author's motto is "to obtain an excellent result, use a little mass". Following this and after light milling, the stratification for the second firing can be carried out.

Fig. 74: The result of the first firing

Fig. 75: Correction firing

Fig. 76: The result of the second firing

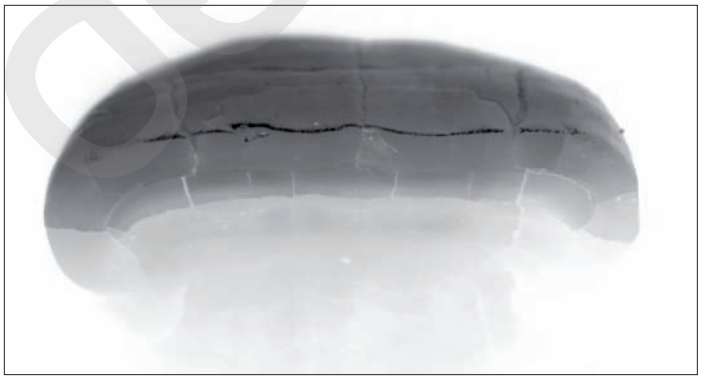


Fig. 77: Small correction of the frontals

Fig. 78: The polished job

Fig. 79: The naturalness of the restoration can depend on the surface texture

Fig. 80: The final result after polishing

Fig. 81: The luminosity is evaluated more easily in black and white, that is to say, using the amount of white present

Fig. 82

Figs. 82 and 83: The high degree of compactness of the microfine ceramic structure significantly reduces the accumulation of plaque, facilitating high quality hygiene work on the rehabilitation.

Fig. 84: The central is fixed on the modified stem using provisional cement

Fig. 85

Fig. 86

Figs. 85 and 86: The functional conformation of the rehabilitation's palatal structures, which are very important to the phonetics, are clearly visible.

Second firing

The effect of depth is still missing because no transparent mass has been used up to this point. The dental technician needs to proceed very carefully indeed: using too much translucent is bad for the restoration. What happens? The value decreases (the restoration becomes greyish in color) and this also compromises the saturation (the restoration becomes pallid). This means that a film of thicker enamel needs to be applied on the incisal area (Windows in this case) while less must be spread on the nucleus so that base color is not lost (Fig. 75). Furthermore, it should not be forgotten that the tooth's opacity is as important as its translucency.

The result can be seen on completion of the second firing (Fig. 76). The gingival mass was applied for the third firing as described for the first firing, and a slight correction of the frontals was carried out (Fig. 77). Condensing the gingival ceramic in the usual way means only one firing needs to be carried out, as can be seen in figure 78.

Surface finishing

Sampling the surface features and characteristics of the surrounding teeth is obviously recommended (Fig. 79). The naturalness of the restoration can depend on the surface texture.

When a restoration, and especially its surfaces, is recognisable as such, the objective has not been achieved. The chalk model clearly shows the texture and the surface morphology can be clearly recognised with the help of articulating paper and silver dust.

The final result after polishing is illustrated in figure 80. The expanded image shows the details: the homogeneity means perfectly smooth surfaces can be produced, essential to obtaining a successful restoration.

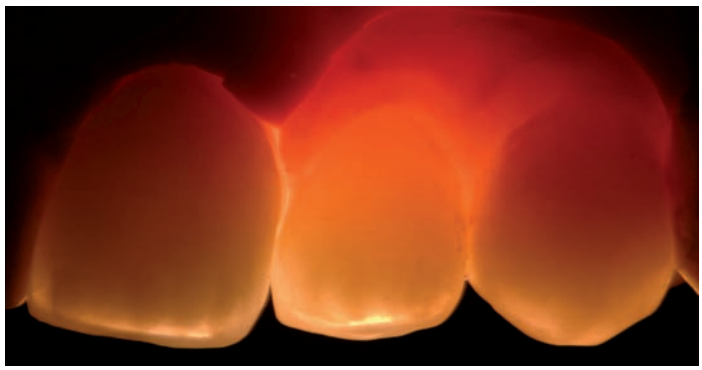


Fig. 87: The natural opalescence can be seen in transmitted light

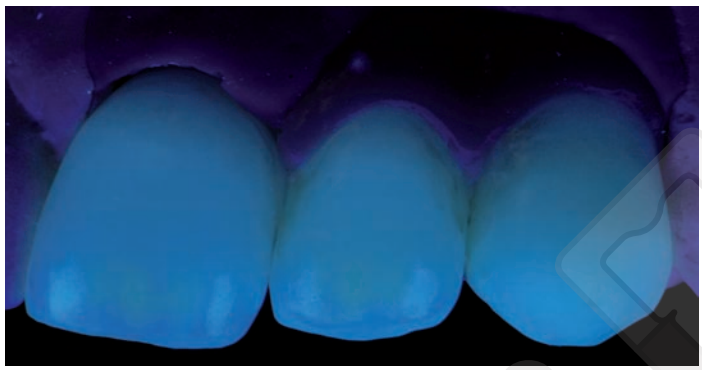


Fig. 88: Observing the same work in ultraviolet light, the high degree of luminosity of the masses used for the mamelons in the incisal area is clearly visible

The luminosity is evaluated more easily in black and white, that is to say, using the amount of white present (Fig. 81).

The high degree of compactness of the microfine ceramic structure significantly reduces the accumulation of plaque facilitating high quality hygiene work on the rehabilitation (Figs. 82 and 83). The stratification of the two incisors is very natural and vivacious, and there is a balanced relationship between translucence and opacity. After having screwed in the zirconium dioxide bridge on the two implants, the central is fixed on the modified stem using provisional cement (Fig. 84). The functional conformation of the rehabilitation's palatal structures, which are very important to the phonetics, are clearly visible in figures 85 and 86.

The natural opalescence can be seen in transmitted light (Fig. 87).

There is no obstacle to the passage of light, which is even transported in the gingiva.

The ceramic restoration is practically indistinguishable from the natural teeth. Opalescence is an effect of natural enamel in which the interprismatic structures act as filters, reflecting radiation with short wavelengths i.e. the blue component. On the other hand, the long wavelength orange passes through the enamel, which is 96% inorganic and 4% organic and therefore non-florescent. The ultraviolet light, that is, the short wavelength radiation invisible to the human eye, is composed of daylight. When it reaches the natural tooth, it penetrates the dentin through the enamel and is therefore reflected. Observing the same work in ultraviolet light, the high degree of luminosity of the masses used for the mamelons in the incisal area is clearly visible (Fig. 88). SD

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About the authors

Luc and Patrick Rutten *After training as dental technicians in Brussels between 1976 and 1979, Luc and Patrick Rutten then worked in various laboratories in Cologne for several years that proved to be decisive for them. Their laboratory in Tessenderlo has been operating since 1985, and is dedicated to ceramics and implantology and the making of internationally recognized restorations. Their convincing creative and technical ability and their brilliant dental photography has enthused colleagues both in Belgium and abroad. Thanks to their motivating style, they have become speakers throughout the world and are the authors of a great many publications including the book "Esthetics on implants" (teamwork media srl) and were co-authors of the book "The state of the art in dental ceramic" (teamwork media srl). They are part of the "teamwork" and "dental dialogue" organizations that publish material for the esthetic sector on implants and individualized stratification techniques for ceramics. Their laboratory Dental Team BVBA is a member of the "dental excellence-International Laboratory Group".*