


# Excellence in Dental Esthetics: A Multidisciplinary Challenge



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[AU: Section headings have been provided throughout; please check for accuracy.]

The esthetic demands of patients have changed significantly in recent years. Often, today's patients seek treatment because they are unsatisfied with the appearance of their old restorations. For the dentist and technician, this means that treatment planning for an implant-supported prosthesis must pay special attention to the final esthetic result.

Both the functional and esthetic results of implant prostheses have improved over the past decade thanks to new surgical treatment methods and enhanced dental materials. This step-by-step case report describes a very extensive treatment using zirconia abutments.

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## CASE REPORT

The 60-year-old female patient presented with her maxillary and mandibular teeth in very poor condition, with unfavorable diastemata in the anterior region (Figs 1 to 4). Preexisting maxillary porcelain-fused-to-metal crowns showed poor function and esthetics. The patient requested treatment of her advanced periodontal disease (Fig 5). It was decided that it would be mission impossible to save her natural dentition. After a thorough examination, partial pocket reduction was performed under anesthesia with a closed flap procedure.

### *Orthodontic Treatment and Provisionalization*

Orthodontic treatment was carried out to reduce vertical bone loss (especially of the anterior teeth), close the diastemata, and provide proper torque and an-

## CASE REPORT



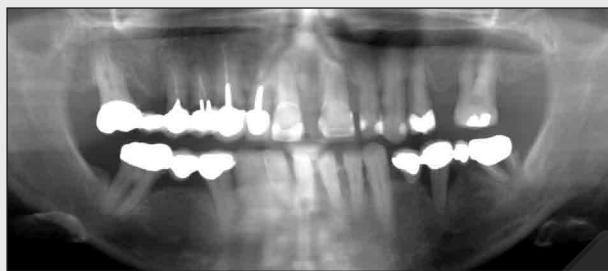
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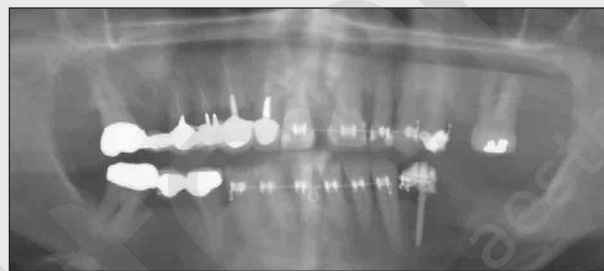
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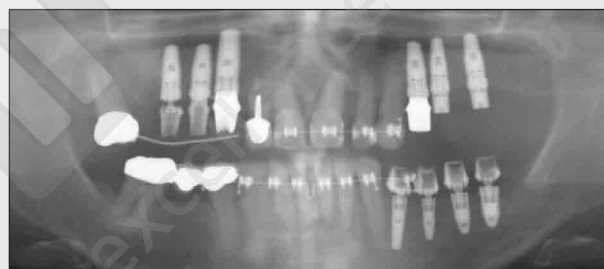
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**Figs 1 to 5** Preoperative situation.

**Fig 6** Orthodontic treatment was carried to reduce bone loss, correct the diastema, and provide proper torque and angulation for the anterior teeth. (Orthodontic treatment provided by Dr Domingo Martin.)

**Fig 7** Posterior implants were placed to aid the orthodontic treatment.

gulation for the anterior teeth (Fig 6). To achieve the orthodontic objectives, the vertical dimension of occlusion required correction. For this reason, posterior implants were placed before orthodontic treatment. This allowed the orthodontist to use the posterior implants as anchorage until correct alignment and bone leveling of the periodontal pocketing were achieved (Fig 7).

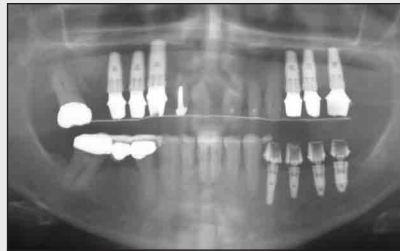
Once orthodontic treatment was complete, a maxillary full-arch provisional restoration was placed by splinting the posterior implants to the anterior teeth

to provide cross-arch stabilization. In the mandible, cross-arch stabilization was achieved by splinting the teeth with wires to the implants on the left side and the prosthesis on the right side (Fig 8). The incisors and the left canine were prepared to serve as abutments for the long-term provisional. The incisors were now in the correct position, and the width-length ratio had greatly improved (Figs 9 and 10).

After 8 months of stabilization, silicone impressions of the adjusted provisional restorations were poured with stone to create a master cast for a radiographic



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**Fig 8** A full-arch provisional restoration was placed following orthodontic treatment.

**Figs 9 and 10** The position and width-length ratio of the incisors were greatly improved.

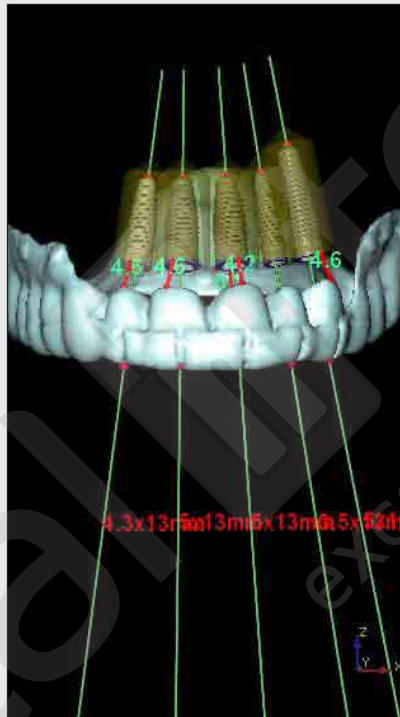


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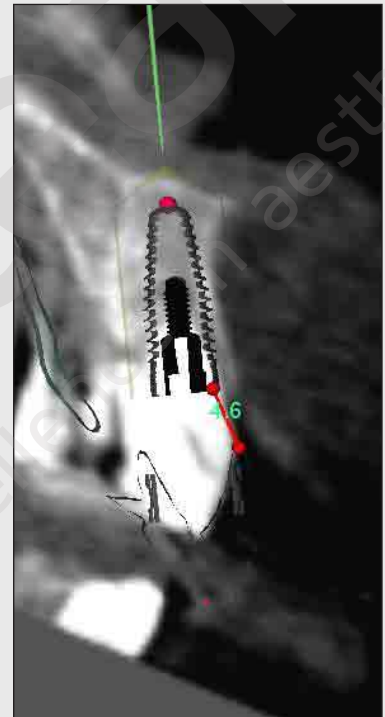
**Fig 11** Silicone impressions were fabricated to create a master cast for a radiographic guide.

**Figs 12 to 14** NobelGuide was used to guide implant and abutment placement.

**Figs 15 and 16** NobelGuide surgical stent. [Au: Correct?]



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guide (Fig 11). A suck-down material was used to fabricate the radiographic guide for the computer-assisted surgical guide (NobelGuide, Nobel Biocare, Göteborg, Sweden), which was used to guide placement

of the implants and zirconia abutments the same day of the tooth extractions (Figs 12 to 14). A NobelGuide surgical stent was fabricated with the surgical template provided (Figs 15 and 16).





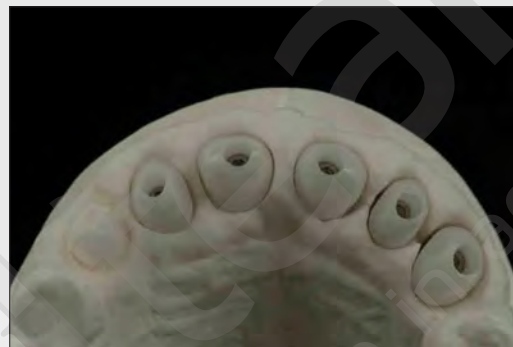
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**Fig 17** Zirconia abutments.

**Fig 18** The screw cylinder sleeve was cut off with a diamond bur using a water-cooled turbine.

**Figs 19 and 20** The silicone key was used as a reference.

The master cast for the maxilla was fabricated using an alternative approach to preserve the soft tissue architecture, as presented in the pickup impression of the relined maxillary provisional restorations. The tissue and tooth morphology were established with the provisionals, allowing for accurate fabrication of the final customized zirconia abutments in terms of soft tissue and crown support as well as finishing line configuration and depth.

The shape of the zirconia abutments was generated mostly automatically using three-dimensional computer-aided design software (Fig 17). After scanning the wax-up and precast abutments, a 1:1 zirconia copy of the scanned waxed-up custom abutment was fabricated. The zirconia abutments were screwed onto the master cast. The fit was excellent, and the gingiva-shaped preparation margin was clearly visible. Toward

the palatal aspect, the preparation margin was at the same level as the gingiva.

The screw cylinder was over-dimensioned; the sleeve had to be cut off with a diamond bur using a water-cooled turbine to fabricate the new long-term provisionals (Fig 18). In each phase, the silicone key of the wax-up was used as a reference (Fig 19). This enables the clinician to determine at the glance if the dimensions of the abutments will allow for layering, shaping, and contouring of the single-abutment crown. The silicone key also helps determine the correct position of the abutment in relation to the targeted tooth shape (Fig 20). This careful, controlled approach is crucial because mistakes made in this phase cannot be corrected.

The teeth were extracted, and implant placement was performed without flap elevation (Figs 21 to 24).





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**Figs 21 to 24** Tooth extraction and implant placement were performed without flap elevation.

**Fig 25** The provisionals were hollowed out and relined to the final zirconia abutments.



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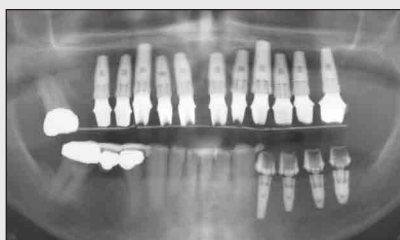
Split-thickness flaps were prepared close to the bone to allow fast and effective insertion of the platform-shifting zirconia abutments during the final stages of the surgical procedure and to enable connective tissue graft placement. Connective tissue grafts were performed on the buccal aspects of the five implants and were packed without sutures below the finishing line on the concave emergence profile of the zirconia abutments. All implants were torqued at 50 Ncm to ensure

primary stability. The customized zirconia abutments were placed with the corresponding platform-shifting adapters and torqued at 35 Ncm.

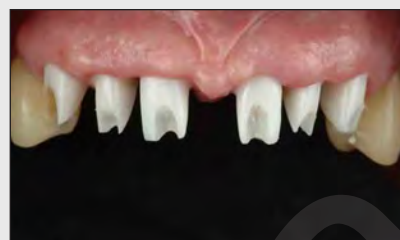
The same provisional restoration was hollowed out and relined to the final zirconia abutments with self-curing acrylic resin (Fig 25). Periapical radiographs were taken at 4, 6, 8, and 12 months to evaluate the progression of bone remodeling and the effect of platform shifting.



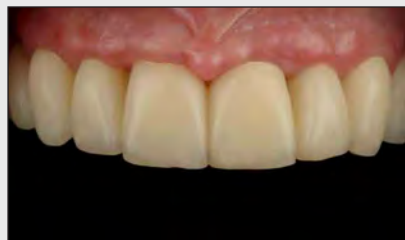
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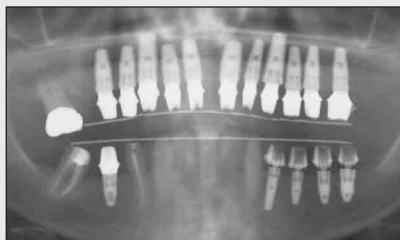
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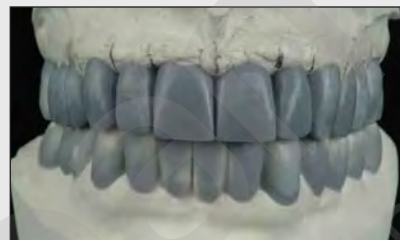
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**Figs 26 to 28** Intraoral and radiographic views showing the soft tissue response after 8 months.

**Figs 29 to 32** A second set of provisionals were fabricated.

Figures 26 to 28 show the soft tissue response after 8 months. Generalized resorption was present at all implants, especially interproximally, which was expected due to the preexisting periodontal bone defect. Some recession was also present, especially between the central and lateral incisors. Retraction cord and hand instruments were used to carefully displace the marginal gingiva apically and to re-prepare the abutment with diamond burs without touching the peri-implant marginal tissues. It was necessary to fabricate a second set of provisionals to adequately support the interproximal and buccal tissues (Figs 29 to 32). As a result of this measure, the horizontal plane and the occlusal plane were realigned. To determine the correct horizontal line of the maxillary incisal edges, the bipupillary line was used as a guide. A wax-up was fabricated to obtain the optimal width-length ratio between the anterior crowns.

With such complex restorations, it is important to produce an esthetically satisfactory provisional restoration. Acrylic resin or composite resin provisionals can be used to control the emergence profile. Addition-

ally, the provisionals can be used to guide the healing contours of the peri-implant gingival tissue in place of a traditional healing abutment. To preserve the soft tissue, it is important that the provisional crowns are polished very smooth and that the cervical margins are designed to promote optimal red-and-white esthetics.

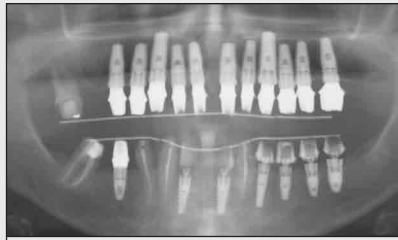
### *Design of the Zirconia Framework*

After reevaluation, it was decided to extract the four mandibular incisors due to their mobility, extensive bone loss, and poor crown-to-root ratio. A four-unit implant-supported prosthesis was considered the ideal restorative option due to the poor bone quantity following tooth extraction (Figs 33 and 34).

A final silicone impression was made of the maxilla and mandible with the use of retraction cord, and, for a few abutments, with the use of Expasyl (Kerr) to retract and displace soft tissue from the abutment margin. Self-curing acrylic resin impression copings were fabricated individually (Pattern Resin, GC, Alsip, IL,

**Figs 33 and 34** The mandibular incisors were extracted, and a four-unit implant-supported prosthesis was placed.

**Figs 35 to 38** Acrylic resin impression copings were fabricated.



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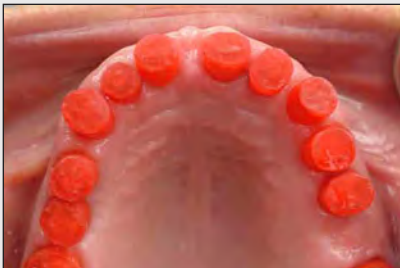
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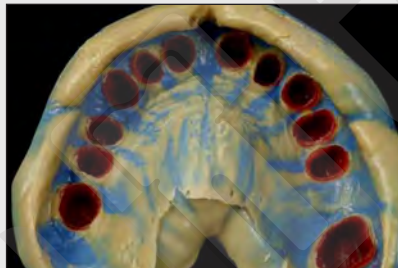
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**Fig 39** Final polyvinyl siloxane pickup impressions.



**Fig 40** Acrylic resin jigs in place to provide stability.

USA) from each abutment to take a final pickup impression (Figs 35 to 38).

The partial impressions of the individual abutments were silver-plated. With a simple galvanizing technique, impressions can be silver-plated within 4 to 6 hours. The time and materials expended are worth the cost because the silver-plating makes the stumps more resistant to wear and abrasion and makes the stump surface completely homogeneous. This provides an enormous advantage since the dies never break and have no bubbles. Further, there is no falsification of the margins. Acrylic resin transfer copings were fabricated directly on the galvanized dies to ensure correct positioning. This type of pickup impression also offers accuracy of the soft tissue topography among multiple implants, allowing the technician to control the interproximal and buccal tissue support with the crown contour. This technique may appear old fashioned considering the use of transfer copings, but the

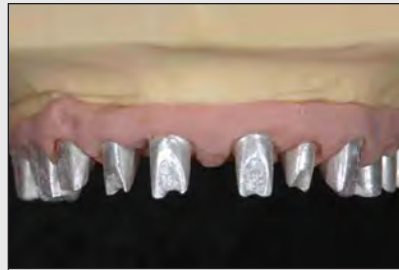
results are solid. The transfer copings fit tightly on the abutments in the mouth to ensure correct placement and prevent rotation during impression taking.

Final polyvinyl siloxane pickup impressions were made of both arches using impression copings positioned on the corresponding zirconia abutments (Fig 39). Next, both full-arch provisional restorations were relieved posterior to the canines to maintain the desired vertical dimension of occlusion while recording centric occlusion for fabrication of the definitive prostheses. Alginate impressions were also made of both provisionals, and a facebow transfer was performed to communicate all necessary information to the dental technician. The dental technician must receive correct occlusal registration records from the prosthodontist. A self-curing acrylic resin jig was used to provide stability for the dentist when determining the maxillo-mandibular relationship (Fig 40).





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**Figs 41 and 42** Removable gingival mask on the cast.



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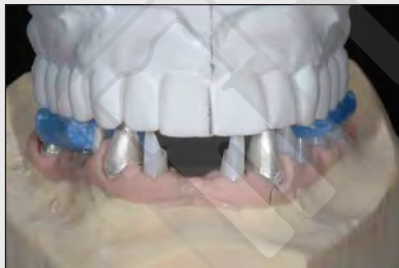
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**Figs 43 and 44** The jigs were used to mount the master casts on the articulator.

**Figs 45 to 47** The casts were cross-mounted on the articulator.



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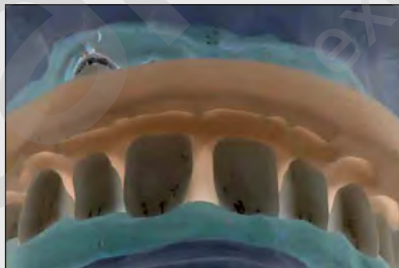
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**Figs 48 and 49** Incisal silicone index.

Now that perfect dies of the zirconia abutments were fabricated, a master cast was needed. The pick-up impression allowed for the fabrication of a removable gingival mask, followed by production of the rest of cast using super hard plaster (Figs 41 and 42). The impression with the resin transfer copings provided the information needed for the master cast.

After the centric relation was recorded, the jigs were used to mount the master casts on the articulator (Figs 43 and 44). It was now possible to examine the max-

illomandibular relationship and determine the space available for the future restoration. The casts of the long-term provisionals were then cross-mounted on the articulator (Figs 45 to 47).

An incisal silicone index was made to record important control information when the articulator was closed (Figs 48 and 49). A labial or buccal silicone index is best used for the design of abutments and copings; as a reference for ceramic veneering, an incisal silicone key should be used. After removal of the

**Fig 50** An ovate pontic was planned at the maxillary right first molar.

**Fig 51** The gingival architecture will collapse during impression taking.

**Figs 52 to 54** A removable gingival mask was used to support the gingiva.



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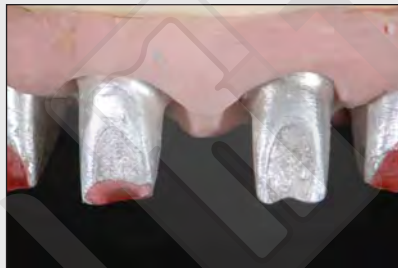


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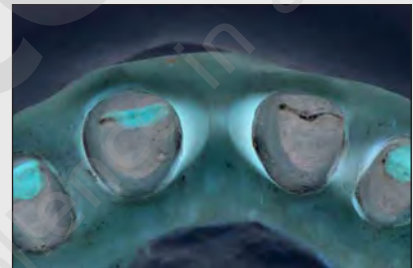


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**Figs 55 and 56** The gingival mask was reshaped to provide a natural appearance.



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maxillary cast of the long-term provisional from the articulator, the proper position of incisal edge can be determined. The space available for the restoration will also be evident.

The patient requested an implant for every tooth; however, no implant had been placed at the maxillary right first molar. The periodontist decided to prepare the gingiva for an ovate pontic (Fig 50). The soft tissue was compensated for with a modified tissue graft.

The arcade-like gingival architecture met the prosthetic requirements for successful esthetic results. Particular attention should be paid to the gingival support in the pontic area. During impression taking, the tediously crafted gingival tissue architecture will quickly collapse (Fig 51). For this reason, the removable gingival mask is crucial to support the gingiva after place-

ment of the restoration (Figs 52 to 54). To support the central papilla, the removable gingival mask should be reshaped to build up the porcelain crown convex. Without proper support, the papilla will not have a satisfying natural appearance (Figs 55 and 56).

The use of the NobelProcera (Nobel Biocare) computer-aided design/computer-assisted manufacture (CAD/CAM) system allows for double scanning. The design of a Procera coping should sufficiently support the ceramic veneer. In some cases, the loss of substance after tooth preparation is so great that 3 mm of ceramic veneer must be used to bridge the distance. There is a high risk of the veneer splitting or cracking; therefore, the Procera coping must be reinforced to support the veneer. The dimensions selected should provide this support while also leaving enough space



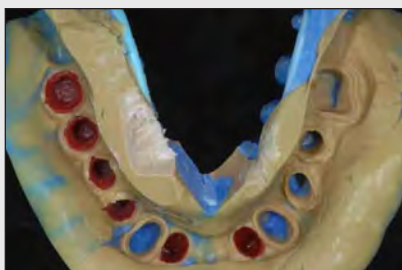
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**Fig 57** Comparison between internal and external scans using Nobel-Procera. [Au: Correct?]

**Fig 58** Master cast and zirconia copings ready for porcelain build up. [Au: Correct?]



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**Fig 59** Mandibular impression with resin transfer copings.

**Fig 60** The dies were stabilized with wax.



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**Figs 61 and 62** Zirconia abutment margins.

for natural-looking crowns. Figure 57 shows the difference between the internal and external scans. On the master cast with the removable gingival mask, the zirconia copings and prostheses were now ready for the porcelain build-up (Fig 58).

At this stage, individual impressions of the zirconia abutments in the patient's mouth had already been taken and silver-plated. Resin transfer copings were fabricated on these galvanized dies. A combined definitive impression of the mandible was taken with the resin transfer copings on top of the zirconia abutments and prepared teeth (Fig 59). It was necessary to unscrew the abutments to correct the margin supragingivally. After galvanization of the prepared teeth, the dies were replaced in the impression. The stability of the dies in the impression was ensured with a small amount of wax while the impressions were poured with hard stone gypsum (Fig 60).

Figures 61 and 62 show the corrected margins of the zirconia abutments. As previously mentioned, is recommended to use a diamond bur with a water-cooled turbine to avoid cracks. The custom zirconia abutments were given a scalloped margin to facilitate cementation of the restorations. The implant-abutment connection lends itself to creation of a natural transmucosal undercontour, which enhances tissue thickness in this critical area.

The connectors to the pontics were designed as large as possible; nevertheless, there was still sufficient space to allow for anatomical shaping, contouring, and natural staining. According to the manufacturer, the connectors should be at least 6 mm ( $2 \times 3$  mm) (Figs 63 to 65). If two or fewer teeth are missing, the connectors should be  $3 \times 2.5$  mm in the anterior region and  $4 \times 3$  mm in the posterior region. If three teeth are missing, the connectors should be  $4 \times 3$  mm





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**Figs 63 to 65** The connectors to the pontics were designed as large as possible.

**Fig 66** Zirconia framework shades (left to right): Standard, Light, Medium, and Intense. [Au: Correct order of shades?]

**Fig 67** Master casts and zirconia frameworks in the articulator.



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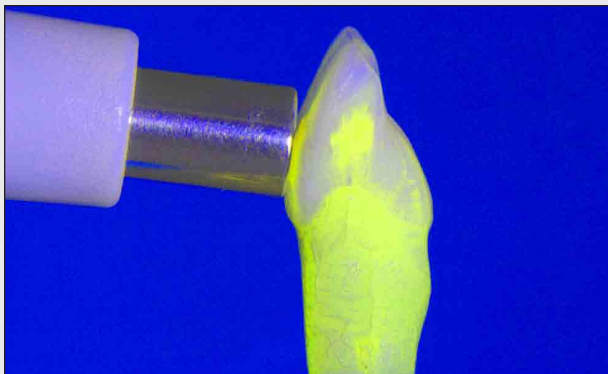


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in the anterior region and  $5 \times 4$  mm in the posterior region. If four teeth are missing in the anterior region, the connector should be  $4 \times 3$  mm; however, note that four missing teeth in the poster region is a contraindication for this treatment.

It is possible to alter the value (brightness) of the Procera zirconia. Zirconia frameworks are available in four different shades: (1) Standard, which is the original shade of yttria-stabilized zirconia; (2) Light, which should be used with bright shades; (3) Medium, which should be used with the most common shades; and (4) Intense, which should be used for high chromatic shades (Fig 66).

The implant master casts with the zirconia substructures are mounted in the articulator (Fig 67). It should be acknowledged that there is some controversy regarding the resistance of zirconia to cracks and chippings. Without proper knowledge and handling, problems with the zirconia will likely be encountered. Alumina and dental alloys are treated and fired in exactly the same way; however, zirconia must be treated differently. It is important to work closely with the manufacture and follow all recommended procedures for handling. The supporting design of the framework is certainly an important factor, but not the only one.



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**Fig 68** Shade taking was carried out with VITA Easyshade Compact.



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**Fig 69** Comparison between (left to right) a natural tooth, individually fired sample of Effect Liner, and cross section of a natural tooth. [Au: Correct?]

**Fig 70** Under ultraviolet light, the fluorescence of the Effect Liner is evident.



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## Porcelain Buildup and Try-in Procedures

Before ceramic is applied, it is recommended to do a regeneration firing in the furnace at 1,050°C to 1,150°C, holding time 15 minutes, without vacuum. A cool down in the furnace is not necessary at this stage because no porcelain has been fired. Procedures such as grinding and sandblasting could change the hexagonal structure into a monocline structure, resulting in problems such as cracks or chipping.

Shade taking can be done with VITA Easyshade Compact (VITA Zahnfabrik, Bad Säckingen, Germany), which can be used to measure 3D-Master shades or Vita Classical shades (Fig 68). This digital measuring system offers accurate shade taking independent of daylight. Since the introduction of the 3D-Master system, all colors can be precisely described, increasing accuracy and communication. The basis of the 3D-Master system is the definition of the tooth color space, which contains all shades found in nature and comprises three variables: value, hue, and chroma.

This system eliminates the subjective nature of shade taking and helps to control what may be the most significant precondition for patient satisfaction and the elimination of remakes. For the present authors, who often work with customers overseas, this also greatly enhances communication. VITA Easyshade Compact offers control over the value and chroma of the finished restorations. Should shade discrepancies arise, minor corrections can be performed in the laboratory.

The observation of cross sections of natural teeth provide a model for how to build up the ceramic. Natural teeth demonstrate the ideal interaction between translucence, transparency, and opacity. Figure 69 shows a comparison between a natural tooth, a cross section of a natural tooth, and an individually fired sample of Effect Liner (VITA Zahnfabrik). Effect Liner can be applied over the zirconia substructure to control fluorescence and brighten the critical gingival zones. The importance of Effect Liners becomes very clear when using ultraviolet light (Fig 70).



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**Figs 71 and 72** The Effect Liner was applied to the zirconia framework.

**Fig 73** The lack of fluorescence of zirconia leads to the presence of dark shadows.

**Figs 74 and 75** The Effect Liner provides fluorescence to the zirconia framework.

**Fig 76** The transition between dentin and enamel is highly fluorescent.



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Based on the recommendations of the manufacturer, the first layer on the zirconia substructure was applied very thin as a prewash layer. This so-called melting layer should be fired at extremely high temperatures (970°C to 980°C) to ensure a strong bond between the zirconia framework and layering porcelain. As previously mentioned, Effect Liner is used for this layer because of its fluorescent properties (Figs 71 and 72). Under ultraviolet light, zirconia frameworks produce an undesirable dark shadow, especially in the cervical area. This is because zirconia does not show

fluorescence (Fig 73). The Effect Liner provides this fluorescence, which helps to retain the appearance of healthy gingiva and improve light transmission (Figs 74 and 75). The highly fluorescent Effect Liners are fired even onto the basal area of the pontics.

Natural dentin is much more fluorescent than tooth enamel. This produces the typical internal illumination of the tooth. The transition between natural dentin and natural enamel is highly fluorescent, which is why Effect Liner is needed to imitate the natural situation (Fig 76).

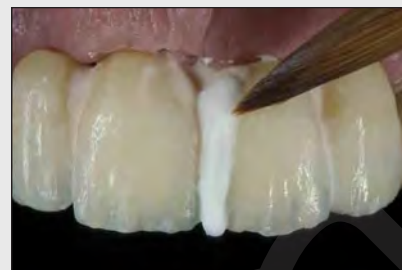




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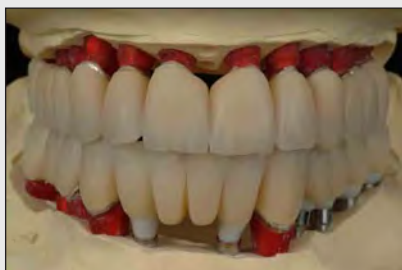


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**Figs 77 to 79** The framework was veneered with a fine-structure feldspar veneering ceramic.

**Fig 80** The crowns were placed on the uncut cast.

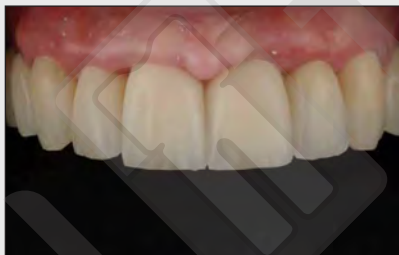
**Figs 81 to 83** Bisque bake try-in.



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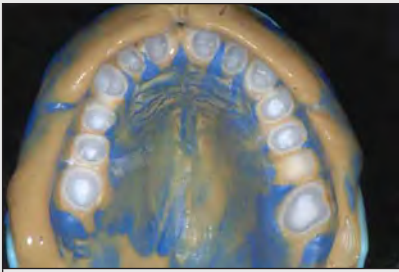
Next, veneering of the zirconia framework was carried out (Fig 77). For this purpose, the authors used an innovative fine-structure feldspar veneering ceramic (Vita VM9, VITA Zahnfabrik) designed for all-ceramic frameworks with a coefficient of thermal expansion from 8.8 to 9.2 (Figs 78 and 79). This veneering ceramic offers excellent esthetics while also providing efficiency and ease of use.

The rubber-polished crowns were placed on the uncut cast for fine adjustment of the marginal ridges and contact surfaces and to produce the final shape (Fig 80). The dies were not movable to provide stability when checking the contact surfaces. The contact area between the two central incisors was particularly long, extending from the remaining papilla and nearly approaching the incisal edges. The interdental contact areas were apically displaced for the lateral incisor, and even more so for the canine. Neither the position nor

the shape of the lateral incisors was equal, which is one of the basic rules for achieving a natural-looking restoration. Of course, this must be communicated to the patient beforehand to avoid possible disappointment.

It was now time for the try-in. A polyvinyl siloxane pickup impression was made from the restorations at the bisque bake try-in to communicate subtle details of tooth contour, contact points, emergence profiles, and occlusal conditions (Fig 81). A try-in of the bisque bake not only allows the patient to approve the results so far, but also represents the ideal phase for precisely adjusting both occlusal and interdental contact surfaces. This clinical try-in confirms the results obtained in the lab. After all, there is no better articulator than the mouth!

The gingiva adapted quickly to the zirconia crowns (Fig 82). Thanks to the use of provisional restorations and the diagnostic wax-up, there were no surprises in the results. The lips and cheeks were well supported (Fig 83).



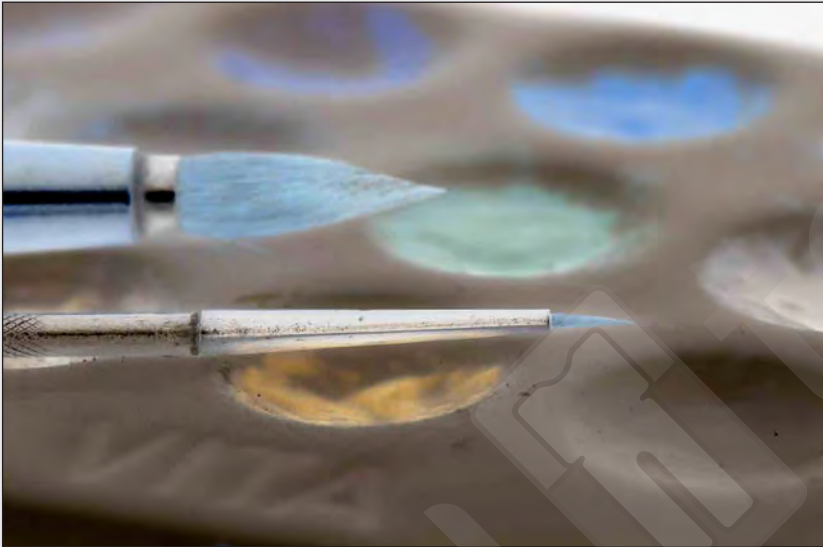
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**Figs 84 and 85** Maxillary and mandibular pickup impressions.

**Fig 86** Working plaster cast.

**Figs 87 and 88** Stains were used to provide minor finishing touches.

Pickup impression of both arches were taken to obtain the latest information regarding the gingiva and papillae (Figs 84 and 85). The crowns were provisionally cemented to guarantee the correct position, avoid rotation or loosening during impression taking, and control the occlusion and articulation in the patient's mouth.

The impressions were then used to obtain working plaster casts without separating dies or removable soft tissue to finalize the form, transition lines, and emergence profile of each crown (Fig 86). These casts provide a 1:1 copy of the actual gingival situation, enabling optimization of the bisque bake. The casts were remounted in the articulator to fine tune the occlusal

surfaces. Minor corrections at this stage are often necessary to optimize the occlusion and articulation. Canine guidance is necessary, and the occlusal surfaces should exhibit the desired cusp-fossa contacts along with the necessary space to allow excursive movements.

If necessary, minor finishing touches and characterization can be applied during glaze firings with the use of staining (VITA Akzent Stains, VITA Zahnfabrik) (Figs 87 and 88). These stains offer natural-looking three-dimensional effects. The difference in brightness is achieved by the matched fluorescence. This means there is no shadow effect after staining, as opposed to with the previous generation of stains.



89

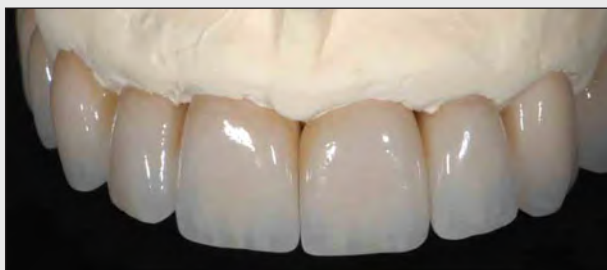


90

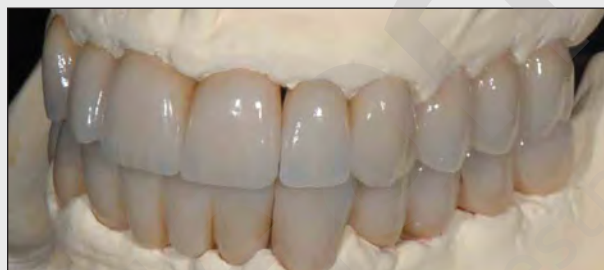
**Figs 89 and 90** No screw access holes are needed when using cemented implant crowns.

**Fig 91** The incisal edge showed an esthetic, natural appearance.

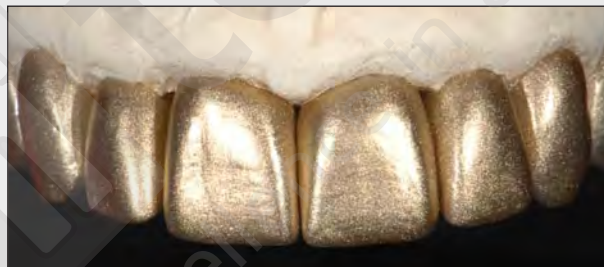
**Fig 92** The occlusal relationship must be checked carefully.



91



92



**Figs 93 and 94** The restorations were coated with gold powder to better examine the surface texture.

The authors prefer to use uncut casts. The saw cut is important for checking marginal transitions but does not provide any information about the proper extent of the gingiva. The occlusal views seen in Figs 89 and 90 show the great advantage of cemented implant crowns: screw access holes have become obsolete. Again, the layering was intentionally kept simple. The esthetic effect is created by the vitality of the incisal area and the harmony of the shape. The incisal edge, which is the most visible part of a tooth, showed a natural appearance due to the fluorescent beige-orange mamelons (Fig 91). The overall layering, especially in the incisal area, was designed to be particularly life-like. The emergence profile turned out well. The contact surfaces perfectly closed the proximal space. The crowns were separated by a delicate incisal triangle.

The zirconia restoration in the mandible showed a slightly overlapping position of the two central incisors. It is common for these teeth to be a little bit

"twisted," so this effect contributes to the natural appearance.

In this case, the esthetic result is only a by-product of the function. The most important factors for complete oral rehabilitation are the occlusion and articulation. Occlusal relationships were checked and adjusted as needed to ensure longevity of the restoration (Fig 92). Since the cusp-fossa contacts always change slightly due to shrinkage, extra attention should be paid to this crucial factor. To correctly mark and grind the centric contacts, occlusion paper of various colors was used. Later, the protrusion and retrusion movements were checked.

Another important issue in the realization of ceramic restorations is the texture. The texture must achieve esthetic harmony with the rest of the teeth. Coating the restoration in gold powder removes the distraction of color and reveals the smallest textural details (Figs 93 and 94). The surface texture will wear down over time as a result of contact with the lips and cheeks,





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**Figs 95 and 96** CAD/CAM-generated zirconia abutments.

**Figs 97 and 98** Zirconia abutments placed in the mouth.



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98

making the teeth increasingly smooth. The incisal edge becomes abraded by the functional movements of the teeth against each other. In terms of function, there is a very finely adjusted contact between the maxillary and mandibular incisal edges.

The crown surfaces and the incisal edge were polished with a rubber polisher before glaze firing, and then, after glaze firing, were polished to a high gloss with diamond paste and a goat hair brush. The lus-

ter of the crowns was gradually adjusted to match the natural teeth.

The components fabricated using the NobelProcera CAD/CAM system offer predictable long-term quality (Figs 95 and 96). The individually manufactured abutments were screwed on the implants and tightened at 32 Ncm (Figs 97 and 98). In the mouth, the preparation margin of the zirconia abutments needed to be located only slightly subgingivally. The gingiva had



99



100

**Figs 99 and 100** Comparison of the pretreatment and posttreatment situations, prior to placement of the definitive restoration.

adapted quickly to the zirconia abutments, providing a healthy appearance. The abutments ensured the required occlusal stability.

Figures 99 and 100 show the progress of the treatment. After orthodontic treatment and extraction of the natural teeth, implants have been placed in the maxilla and mandible. Custom zirconia abutments were then placed to allow correct positioning of the zirconia crowns.

### *Final Result*

All definitive restorations were cemented with RelyX Unicem (3M ESPE). The cervical margins of the crowns were shaped to support the papillae and gingiva. Assuming the prosthodontist has communicated the necessary information, it is nearly impossible to make

mistakes on an uncut cast of a pickup impression. Nevertheless, dental technicians must be very disciplined and take extra time to precisely adapt the cervical areas. In this case, the crowns clung perfectly to the gingiva, and the soft tissue reacted positively to the restoration. The gingiva and papillae recovered well (Figs 101 to 103). The arcade-like shape of the gingiva and the "pseudo papillae" were created by the periodontist. The success of this restoration lies in the shape and position of the crowns in harmony with the whole face. A natural incisal edge must be present. The overall appearance had completely changed compared to the baseline situation. Final occlusal parameters were evaluated and adjusted after cementation.

Alginate impressions were made to fabricate a night guard and secure the full-mouth rehabilitation (Fig 104). For this kind of total rehabilitation, a night guard is strongly recommended to avoid unexpected

**Figs 101 to 103** The soft tissues adapted well to the restoration.

**Fig 104** Night guard fabricated to protect the restorations during sleep.

**Fig 105** Smile view showing the restoration in harmony with the lips.



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105

changes in vertical dimension, articulation, and occlusion. All previous treatment efforts will go out the window if the patient's nocturnal stresses lead to damage of the ceramic.

The restoration must be observed within the context of the lips and cheeks. In this case, the restoration showed excellent facial esthetics. The lip lines were in

harmony with the incisal edges and the curve of the lips. When the patient smiled, the visible teeth corresponded well with the natural situation (Fig 105). Figures 106 to 109 allow for comparison of the initial situation with the final result. The patient was very satisfied with the results. Periodic follow-up visits were scheduled at 6-month intervals.





106

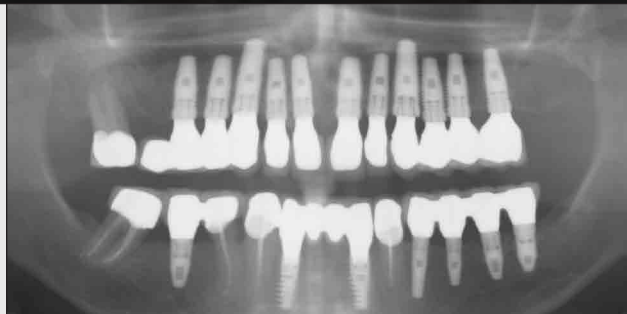
**Figs 106 to 109** Intraoral views showing the initial situation versus the final result.



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108



109

## CONCLUSION

The clinical success of this restoration required clinical knowledge and experience; however, even with such experience, detailed diagnosis and treatment planning are crucial. A complex case such as this also requires well-organized teamwork between the fields of orthodontics, periodontology, implantology, prosthodontics, and dental technology. The combination of modern CAD/CAM systems and new surgical approaches such as computer navigation help to optimize restoration of the soft tissue and bone and provide esthetically satisfying long-term results.

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