

# The **finesse** of the pink and the **power** of IPS e.max

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## Introduction

When damage to dentition is too severe for restorative treatment to be feasible, conventional dentures have been the treatment of choice. Conventional dentures, however, can be foul smelling and uncomfortable.<sup>1</sup> Additionally, jawbone resorption causes the dentures to become loose over time requiring readjustment of the jaw to ensure a proper fit.<sup>2</sup>

In some cases, if resorption has already occurred, the patient will no longer have sufficient bone structure to support dentures.<sup>2</sup> To overcome the disadvantages associated with conventional dentures, new implant materials and techniques have been developed, providing the growing edentulous population with more opportunities for functional, stable and comfortable treatments as well as decreased bone loss.<sup>3</sup> Due to the amount of masticatory forces placed on the prostheses as a result of implant support, stronger, more durable substructures and denture teeth are necessary to accommodate wear.<sup>3</sup>

Zirconia is one of the strongest materials available in the dental industry today demonstrating a flexural strength of approximately 900–1,100 MPa.<sup>4</sup> Ideal for high-stress restorations, including implant dentures, zirconia restorations boast a failure-free reputation according to current research.<sup>5</sup> Designed and fabricated using CAD/CAM technology, zirconia substructures are stronger and more durable than traditional denture prostheses.<sup>6</sup> Innovative techniques provide long-term and patient-pleasing results.

When fitted with customised lithium disilicate dentition, fixed implant prosthetics will not develop a foul

smell, require no realignment and provide a predictable, highly aesthetic and life-long solution. In addition, CAD/CAM technology can be used in the office or laboratory for indications including full-mouth restorations, fixed partial dentures, implant abutments, crowns, veneers, inlays, and onlays,<sup>7</sup> contributing to faster and easier restorative treatments.

Suitable for restorations requiring high strength and exceptional durability, IPS e.max ZirCAD (Ivoclar Vivadent) is a yttrium-stabilised zirconia demonstrating a flexural strength of more than 900 MPa, and a fracture toughness of more than twice that of glass-ceramic materials.<sup>8</sup>

With approximately 50 per cent porosity, the pre-sintered blocks allow easy processing. Yet, once sintered to full density, its superior strength and inertness make it an ideal material for dental restorations.<sup>8</sup> IPS e.max ZirCAD blocks (Ivoclar Vivadent) meet the functional requirements demanded by posterior masticatory forces.

Despite the use of different IPS e.max framework materials (lithium disilicate or zirconium oxide), aesthetic results can still be achieved due to a selection of natural and shaded pre-sintered zirconium oxide blocks for colour versatility, and when layered with aesthetic ceramic materials, such as IPS e.max Ceram (Ivoclar Vivadent), good aesthetics can be attained.<sup>9</sup>

The lithium disilicate ingots are specifically designed for press-on procedures indicated for zirconium oxide-supported gingiva portions, single-tooth restorations, anterior and posterior bridges, inlay-retained bridges, and implant superstructures.<sup>10</sup>



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

**Figs. 1 & 2**\_Preoperative images of the patient's dentition.

**Fig. 3**\_Panoramic X-ray of the patient's mouth.

**Fig. 4**\_Immediate dentures were placed the day of surgery.

**Fig. 5**\_A face-bow transfer was performed.

**Fig. 6**\_A zirconia-hybrid prosthesis would be fabricated for the upper arch and an acrylic prosthesis for the lower.

**Fig. 7**\_Image of the duplicate denture.

**Fig. 8**\_Plastic temporary abutment placed over the multi-unit abutment.

**Fig. 9**\_Part A&B of the resin is mixed together.



Fig. 7

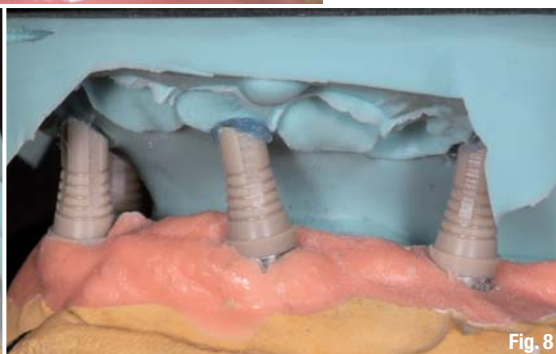


Fig. 8



Fig. 9

**Fig. 10**\_The resin is applied to the denture.

**Fig. 11**\_Image of the resin denture.

**Fig. 12**\_The frame was designed and scanned.

**Fig. 13**\_The zirconia frame was tried in.

**Fig. 14**\_IPS e.max Ceram pink colours were chosen from the shade guide.

**Fig. 15**\_The frame was characterised with Zirliner 1 and fired.

**Figs. 16 & 17**\_A full-contour wax-up was completed.

**Fig. 18**\_The frame was masked by layering IPS e.max Ceram in intensive pink porcelain, opal enamel white and opal violet.

**Fig. 19**\_Characterisation of the porcelain was finalised using Essence stains.



Fig. 10



Fig. 11



Fig. 12



Fig. 13

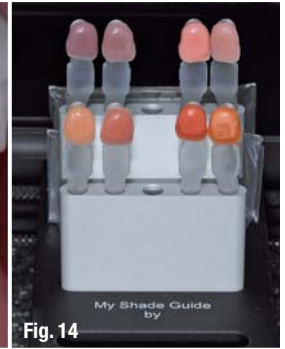


Fig. 14



Fig. 15



Fig. 16



Fig. 17



Fig. 18



Fig. 19



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Manufactured in nine block sizes, the larger ones suitable for long-span bridge frameworks or for stack milling and the smaller ones for copings, zirconia substructures can satisfy patient's demands for high-strength, highly aesthetic, functional, fixed prosthetic results.<sup>10</sup>

The All-on-4 treatment concept (Nobel Biocare) includes fixed and removable prosthesis and can be used in combination with a full-arch zirconia substructure as well as a variety of implants (Nobel Active, Nobel Biocare). The ability to screw a provisional prosthesis onto the implants directly after surgery provides edentulous patients with an immediate implant-supported restoration.<sup>11-15</sup> Accommodating a wide range of abutments and prosthetics, this technique benefits patients by providing an aesthetically pleasing, comfortable, stable and functional prosthesis.<sup>11-16</sup>

## Clinical Protocol

The patient presented with severely worn and damaged dentition (Figs. 1 & 2). After performing a panoramic X-ray of the patient's mouth, it was decided that the complete removal of all remaining teeth was necessary (Fig. 3). The treatment agreed upon was the application of the All-in-4 technique (Nobel Biocare).

Therefore, the first step was to guide the placement of the four RP Nobel Active implants, and the multi-unit transmucosal abutments used to facilitate tissue level emergence by creating a precision surgical implant guide. Once the implants were placed, impression copings were inserted, an impression was taken from which to create the master cast and immediate dentures were placed (Fig. 4).

A face-bow transfer was performed to idealise the parameters for a precision restoration (Fig. 5). At this point, the decision was made to fabricate a zirconia-hybrid prosthesis for the upper arch and an acrylic prosthesis for the lower (Fig. 6). A laboratory verification jig was created from the master cast to guarantee the accuracy of the final fit. To set tooth arrangement and function, an occlusal wax rim was created. The set-up was then screwed in, the bite verified, and phonetics, function, and aesthetics approved.

## Laboratory Protocol

The patient-approved immediate denture was duplicated and mid-line smile design and curve positions, i.e., Wilson spee, incorporated (Fig. 7). The plastic temporary abutment was placed over the multi-unit abutment (Fig. 8) and parts A and B of the resin were mixed and applied over the plastic abutment (Figs. 9 and 10), creating the resin denture (Fig. 11). The frame was designed and the scanning process performed (Fig. 12). The zirconia frame was tried in (Fig. 13). A variety of samples of IPS e.max Ceram were chosen from the shade guide to produce natural colouration and mask the white zirconia frame (Fig. 14). The colour was tested with the same background as the frame colour to evaluate the shade intensity of intensive dentin and dentin. The frame was characterised with Zirliner 1 and baked at 1,060 °C to create a bond between the zirconia and ceramic (Fig. 15).

A full-contour wax crown design was completed (Figs. 16 & 17). Intensive pink porcelain (IPS e.max Ceram) was built up to mask the frame and mixed with opal enamel white (OE4) and opal violet in specific areas to create a natural look. The bake speed was lowered to 35°C per minute, held for one minute at 760 °C, cooled at a rate of 25 °C per minute and held at 350 °C for 15 minutes (Fig. 18).

Characterisation of the pink porcelain was finalised using Essence stains (Ivoclar Vivadent). Low speed rates were used to fire the glaze. Fired at 35 °C to 730 °C for one minute, the glaze was then slowly cooled at 25 °C per minute and finally held at 350 °C for 15 minutes (Fig. 19). Next, the crowns were glazed with shades one and two of copper, white, cream, profundo, mahogany, ocean and sunset, then baked at 775 °C per one minute hold (Figs. 20-25).



Fig. 20



Fig. 21



Fig. 22



Fig. 23



Fig. 24



Fig. 25

**Figs. 20–25** The crowns were characterised with shades one and two of copper, white, cream, profundo, mahogany, ocean and sunset, then fired.

**Fig. 26** The case was ready for bonding.

**Figs. 27–29** The case was primed with Monobond.

**Fig. 30** The IPS e.max crowns were etched with 5 per cent hydrofluoric acid.

**Fig. 31** The crowns were cemented into place, leaving the screw holds vacant.

**Fig. 32** Image of the healthy soft tissue and the angulation of the multiunit abutments.

**Fig. 33** The case was torqued into place.

**Fig. 34** Image of upper arch with IPS e.max crowns and the Phonares acrylic teeth in the lower arch.

**Fig. 35** Postoperative occlusal view verifying balance and occlusion.



Fig. 26



Fig. 27



Fig. 29



Fig. 30



Fig. 31



Fig. 32



Fig. 33



Fig. 34



Fig. 35

## \_Seating

Once the patient was satisfied with the colour, phonetics, and smile line (Fig. 26), the case was prepared for bonding. The zirconia and titanium were primed (Monobond, Ivoclar Vivadent) to create mechanical and chemical retention in both materials. The case was then cemented using universal adhesive implant cement (Multilink Implant, Ivoclar Vivadent, Figs. 27–29).

Prior to cementing the crowns in place, they were etched with a 5 per cent hydrofluoric acid for 20 seconds (Fig. 30). All crowns were cemented into place except those that fit over the screw holds (Fig. 31), which would be cemented once the case was seated (Fig. 32). Finally, the dentures were torqued into place (Fig. 33). IPS e.max crowns were used in the upper arch and Phonares acrylic teeth in the lower (Fig. 34) to equipoise the forces and achieve a balanced occlusion providing the patient with the highest quality of function and phonetics (Fig. 35).

## \_Conclusion

Previously limited to sometimes ill-fitting and painful false teeth, edentulous patients today have a variety of sophisticated treatment options. Due to

their ease of use, predictability and its many advantages, CAD/CAM technology, pressable and milled ceramic materials and new implant structures enable dentists and laboratories to provide comfortable, stable and aesthetic treatments to edentulous patients.<sup>7</sup>

Newly developed, innovative alternatives are more durable, aesthetic and last longer compared to conventional options. Implant-supported dentures fabricated with materials such as zirconia and IPS e.max ZirPress not only demonstrate superior characteristics, but are stronger and more durable.<sup>3,17</sup> Modern procedures and materials can satisfy patient demands by providing denture treatments that are long-lasting, strong and aesthetically pleasing.

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