From Dentures to an Esthetic Implant Restoration

Fixed Implant-Supported Bridge for the Maxilla and Mandible

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Abstract

This clinical case presents a patient who wished to go from full dentures to esthetic fixed implant-supported restorations. There had been mild to moderate hard and soft tissue loss. Treatment was carried out using a combination of classic prosthodontic techniques and CAD/CAM technology. The process presented here is a step-by-step technique.
Zirconia frameworks now provide the ability to create ceramic restorations that mimic the natural dentition in nearly all aspects.
Introduction
Many people are unhappy wearing dentures. Often it is difficult for people to accept a denture as a restoration. Particularly for younger people, it can be psychologically distressing that this is their restoration for life, and reduced function and esthetics can cause loss of confidence and self-esteem. Dentures can be very aging, both physiologically and psychologically.

Fortunately, with current implant technology, fixed restorations can be provided. Zirconia frameworks now provide the ability to create ceramic restorations that mimic the natural dentition in nearly all aspects.

Case Report
The patient presented (Fig 1) with an existing implant bridge in the lower arch and wanted to replace her full upper denture with an implant-supported bridge. She had worn a full denture for many years, having it remade every five years or so to keep as good an appearance as possible. Her primary esthetic concerns were that her upper lip did not sit properly, the teeth were very “full,” and her lower lip did not sit symmetrically (Figs 2 & 3).

Full clinical, esthetic, and radiographic analysis was carried out. The upper ridge was not heavily resorbed, but flattened (Fig 4). The existing denture had an irregular occlusal plane, the buccal corridors were filled, and the upper incisors were too far forward (Fig 2). The decision was made to provide a six-implant supported upper zirconia bridge with buildup, with pink replacement due to the flattened ridge. At the same time, the lower implant bridge would be remodeled to align the occlusal planes, open the vertical dimension, and coordinate the upper and lower lip support.

As the patient had worn a full denture for so long, it was difficult to determine the ideal incisor tooth size, shape, and position.
Treatment Planning and Treatment

The treatment plan was to replace the lower bridge with new acrylic teeth. Due to the patient’s high esthetic expectations, ceramics would be used to restore the upper arch.

The implants were placed avoiding the upper incisor region. This tooth position would not then be negatively influenced by the implant position.

As the patient had worn a full denture for so long, it was difficult to determine the ideal incisor tooth size, shape, and position. Initially the upper denture was remade, to attempt correction of some of the presenting problems (Fig 5). The implants were placed using a surgical guide based upon this denture as it was thought that the final tooth size would be similar to the denture teeth and that pink replacement would be necessary.

At this stage, neither we nor the patient were happy with the appearance. The lip still appeared too full, with the arch width too wide so there were no buccal corridors. We asked the patient to bring in a photograph of her natural teeth. This showed a larger central incisor, narrower upper arch form, and incisor edges sitting just inside the lower lip (Fig 6).

A master cast was obtained and a diagnostic setup was done direct to fixture level.

Several diagnostic setups were carried out, first in wax (Figs 7 & 8) and then acrylic until all parties were happy with the appearance of the smile, lip support, and facial height (Figs 9 & 10). The tooth sizes and arch form were now very similar to the appearance before tooth loss.
**The Problem—Fixture Alignment**

What was evident now was that no pink replacement was necessary. However, when the setup was transferred to the master cast and duplicated in wax, the emergence of the screws through the occlusal was not ideal and the emergence at the gingival was not right in the center of the tooth (Figs 11 & 12). This would create problems with contouring and cleaning. Also, the canine implants were not deep enough to allow for angled abutments and the screw access was through the incisal edge (Fig 12).

**The Solution**

The solution was to alter the tooth dimensions for the posterior teeth, and to place angled abutments at the #14, #15, #24, and #25 positions to allow exact emergence from the implants. On each side there would be one rather than two premolar teeth. At the canine implants, custom abutments were designed and milled. Galvano copings would be used to allow passive fit of the zirconia framework. There would be screw retention posteriorly, idealized by the angled abutments through the middle of the occlusal surfaces, cemented to the custom abutments with provisional cement at the #13 and #23 abutments.

**Finalization of Restorations**

Now that the upper arch abutments (Fig 13) and tooth position had been finalized, the lower bridge was completed and a provisional acrylic bridge placed in the upper to confirm the new positions. Pontic forms could also be developed at the ##12-22 positions (Fig 13). A new master cast was formed (Fig 14).

The lower bridge was completed in acrylic to avoid ceramic-to-ceramic occlusal contact. Otherwise all traditional prostodontic principles for function, esthetics, and cleansibility were fulfilled. All tissue-fitting surfaces were convex and highly polished (Fig 15), there was access adjacent to each implant for cleaning, and there was minimal thickness of the bridge so that tongue function would not be compromised. The gingival esthetics were idealized using pink acrylics.

The final wax-up was tested on the abutments in acrylic as a final check and to confirm patient approval of tooth size, shape and position, lip support, and occlusion (Fig 16).

Once this acrylic had been checked clinically it was cut back from the buccal and occlusal/incisal (Figs 17 & 18). One side at a time was prepared to ensure correct cutback thickness. This was essential to ensure the best properties of the layering ceramic.

The acrylic framework was scanned and the milling center proceeded to reproduce this precisely in zirconia. Before sintering, the framework design was...
checked with us via e-mail (Fig 19). The framework was then milled, sintered, and delivered back to the laboratory (Fig 20).

The layering commenced with dentin buildup to full contour (Fig 21), dentin cutback (Fig 22), and enamel stratification (Fig 23).

For the first firing, the bridge was heated very slowly. This ensured that the framework was evenly heated; otherwise, the porcelain would not be homogeneous and well fired. We set the temperature at 810 °C, 10 degrees higher than recommended by the manufacturer. After firing, the bridge was tried in the mouth to check the shape, length, and color (Figs 24-27). At this stage minimal modifications were required.

A second firing completed the shape (Fig 28). The texture was designed with a pencil, showing areas to trim and shape to give the

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restoration life and personality (Fig 29). The aim was to provide a non-homogenous surface that lets light reflect at many different angles, as well as translucence at the incisal edge (Fig 30). The surface then needed to be polished smoothly to attain the desired effect—a tooth-like reflective surface (Fig 31).

Completion of the Upper Bridge
Figures 32, 33, and 34 show how the thickness of the layering porce-
lain onto the zirconia framework was managed.\textsuperscript{5,6}

Time was taken to refine, smooth, and polish the bridge. This was particularly important so that the fitting surface had good adaptation to the soft tissues (Figs 35 & 36).\textsuperscript{7-9} The ovate pontic needed just the right pressure to create the emergence profile and to avoid food impaction (Figs 37 & 38).\textsuperscript{10}

The next three images show the evolution of the restoration. At presentation with the old denture, the

“... This case highlights the importance of a careful diagnostic provisional phase even when implants are already in place.”
upper and lower lips are distorted and pushed forward, there are no buccal corridors, and the vertical dimension is overclosed (Fig 39). With the provisional acrylic restoration, the lips are symmetrical, the facial height is restored, and the arch form is more harmonious (Fig 40). The final image in the series (Fig 41) shows how carefully the provisional restoration has been mimicked in the final bridge. The maxilla occlusal plane follows the lower lip contour and incisal edges sit at the wet-dry line (Fig 42).

**Results**

Figure 39: Patient at presentation.

Figure 40: Patient with temporary.

Figure 41: Patient with final restoration.

Figure 42: Restoration in harmony with lips.
A truly beautiful esthetic result was achieved. The upper and lower lip support, tooth sizes, and arch form have recaptured the appearance of the natural teeth.

Maintenance was made easier by natural tooth pontic form and direct emergence from the implants without any overhanging flanges. The acrylic-to-ceramic occlusal scheme reduced the risk of ceramic fracture. The zirconia framework was the ideal dimension to support the minimal build-up of ceramic (Figs 43-48).

This case highlights the importance of a careful diagnostic provisional phase even when implants are already in place. This allows for patient approval and refinement of esthetics, but most importantly with zirconia, the idealization of the framework design. All future risks will be managed as well as possible.
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References


Figure 47: Patient with the restoration.

Figure 48: Harmony.

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