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in this issue

An implant is not always an option

Accreditation Case Type 3
Tooth replacement

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Knowing how to get a so-called 'old' technique to deliver an aesthetically pleasing result is just one of the many skills needed by today's cosmetic dental team. This example of replacing a missing tooth with an adhesive bridge, demonstrates just what can be achieved with the right blend of knowledge, skill and attention to detail. Tooth replacement involves the soft tissue just as much as the hard tissue, and takes pretty much everything in our cosmetic dentistry toolbox to ensure an aesthetically superior outcome. Working with a lab technician who understands soft tissue is critical for Accreditation Case Type 3.

Introduction and patient's chief complaint

The patient initially presented to the practice requesting an improvement to the aesthetic appearance of her tooth 21, which had previously been replaced by a porcelain-bonded-to-metal Maryland bridge.

Medical and dental history

There was no significant medical history. The patient had lost the 21 in a childhood accident.

Examination and Diagnosis

On examination it was noted that a resin-retained bridge replaced tooth 21 and that there had been gingival recession at the 11, resulting in a significant height to width discrepancy between 11 and 21. There was also a small chip at the mesial incisal corner of 12. The existing bridge had been in situ for over 16 years and although this was functioning satisfactorily, the aesthetics were now extremely poor. The form of the tooth did not mirror that of her natural 11 and the colour did not match.

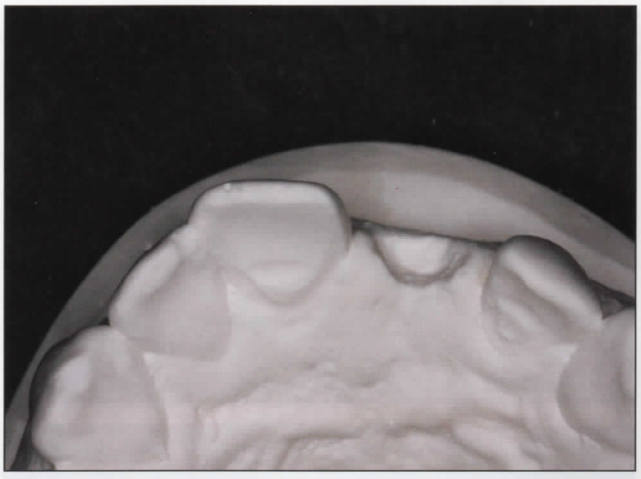
Treatment plan

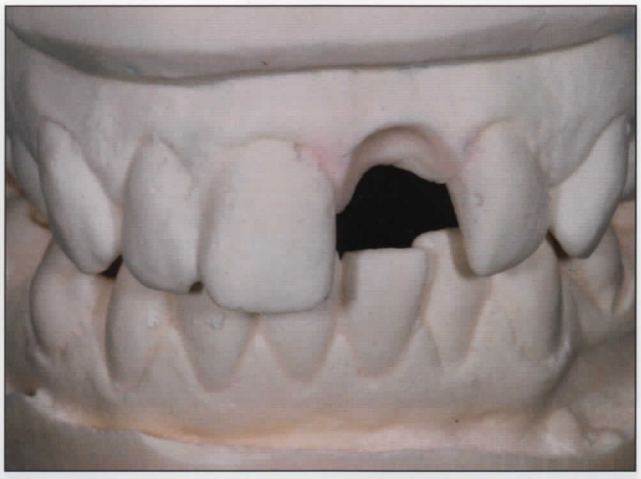
As the previous adhesive bridge had proved durable over a long period and an implant was not an option due to financial constraints, the aim of treatment was to replace the existing bridge with a new one of a similar design utilising two retaining wings.

Treatment would include a gingival graft to 11 to reverse the gingival recession and help restore the correct length to width ratio and symmetry of the teeth. The mesial incisal chip on 12 would be restored

Figure 1: a-b – Full face: *Before (left) and after (right) images of the case*

Figure 2: a-b – Occlusal view of upper model (a - left). The models articulated (b - right).





with direct composite bonding to complete the overall aesthetic improvement of the patient's smile.

Clinical treatment

The patient was referred to a periodontist for gingival grafting and the existing resin retained bridge was modified with composite resin to develop an ovate pontic site for 21. Following this, the patient became pregnant and did not return for active treatment until some three and a half years later.

During this period I understand that the temporary had de-bonded a number of times, which had caused the lateral to distalise, resulting in a larger mesial-distal space than was initially present.

This made it difficult to produce the same length to width ratios between 11 and 21. Once the patient resumed treatment, she was then very slow to attend between appointments, which all resulted in a rather protracted treatment cycle.

Description of preparation design

The preparation design was kept away from the incisal edge with very minimal preparation into the enamel, which was just enough to aid positioning of the bridge. The two-wing design of her previous bridge was followed to maximise the surface area for bonding, although the wings would only extend half way up the palatal surface of each tooth. This design would avoid any 'show through' or greying of the teeth from the dark metal behind and had already proved successful for over 16 years with her previous bridge. The ovate pontic site would help to create a more natural emergence profile for the 21.

Discussion

Although Zirconia Maryland bridges are gaining popularity, its poor bonding properties mean the results are varied when using this material for such cases. Newer bonding techniques have mostly solved this problem, but the author preferred a bonded-to-precious-metal solution for this case due to its strength and predictability.

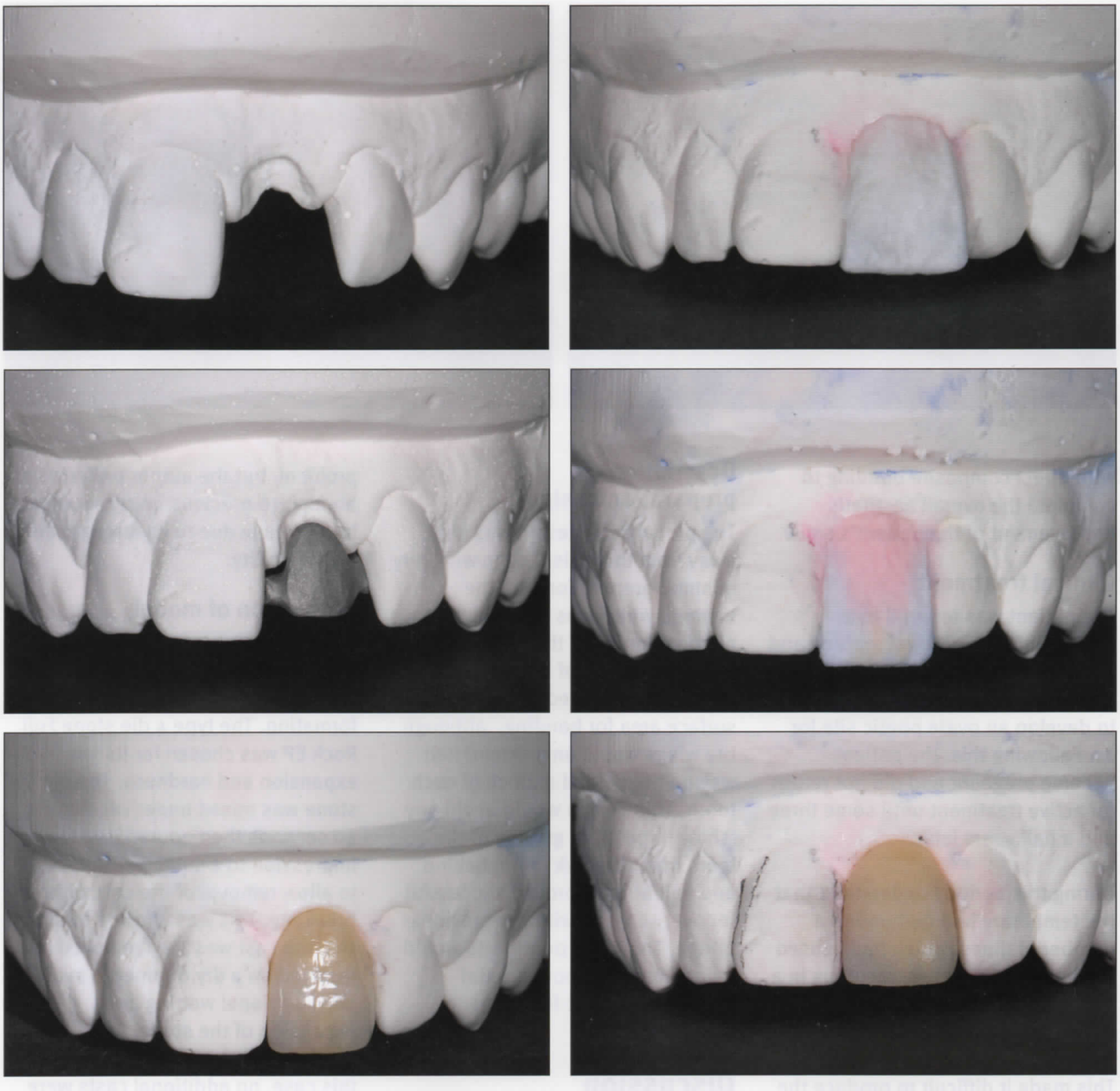
Production of model

The impression was first sprayed with a wetting agent to aid the flow of die stone and help reduce bubble formation. The type 4 die stone Fuji Rock EP was chosen for its low expansion and hardness. The die stone was mixed under vacuum for 40 seconds then poured into the impression to a sufficient thickness to allow removal of the cast without breakage. This was allowed to set for 1hr. The cast was then removed and trimmed on a dry trimmer to avoid any additional wetting and expansion of the stone. As a sectional model was not required for this case, no additional casts were made.

Design and production of framework

In preparation for the wax pattern, the soft tissue site of the model was first relieved by approximately 1mm

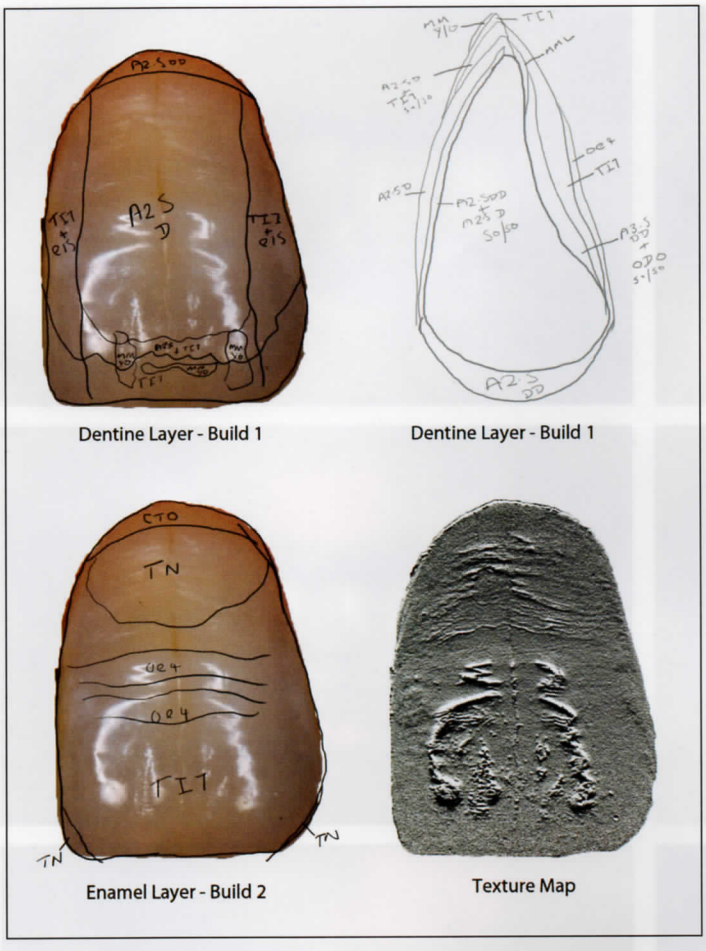
Figure 3: a-f – Associated laboratory models of the case



to allow for compression of the tissues. The model was then sealed and the palatal surface of each adjacent tooth was coated with a thin layer of die spacer to allow for the cement layer.

Separating agent was applied to the model and wax was directly applied to the palatal of each supporting tooth to form the wings. Once this had set, a pre-formed pontic was joined to the first wing and allowed to cool before connecting the adjacent wing to minimise distortion whilst cooling. The shape of the pontic was then adjusted and the pattern was removed from the model. The fit was checked under magnification and the wax pattern was then attached to a 3mm sprue,

Figure 4: Shade diagram



and the framework was de-gassed for 5 minutes to remove any unwanted contamination that could cause bubbling or discolouration of the ceramic. This would also form an oxide layer to aid in bonding of the layering ceramic.

Layering of ceramic

Ivoclar In-Line ceramic was used for this case, as this material has been found to be colour-stable with minimal shrinkage, whilst maintaining exceptional homogeneity over multiple firings.

A body shade of A2.5 was chosen with a slight increase in chroma at the middle cervical third and neck. Following degassing, A2 opaque was applied to the pontic then fired and repeated once more. A2.5 deep dentine (DD) was used to form the pontic base and neck. A mix of A2.5 DD and A2.5 dentine (D) was used to cover the body of the pontic and

Figure 5: Lab prescription including shading diagram

ready for mounting to a casting base before investing. The pattern was then weighed to calculate the amount of metal required for casting. Once mounted in the casting ring, Fujivest Super was mixed and poured as per the manufacturer's instructions and allowed to set for 20 minutes before placing it into a cold furnace in readiness for casting. Once the burnout programme was complete the hot ring was cast using a centrifugal casting method and allowed to cool before divesting with glass beads. The fit was then checked again under magnification

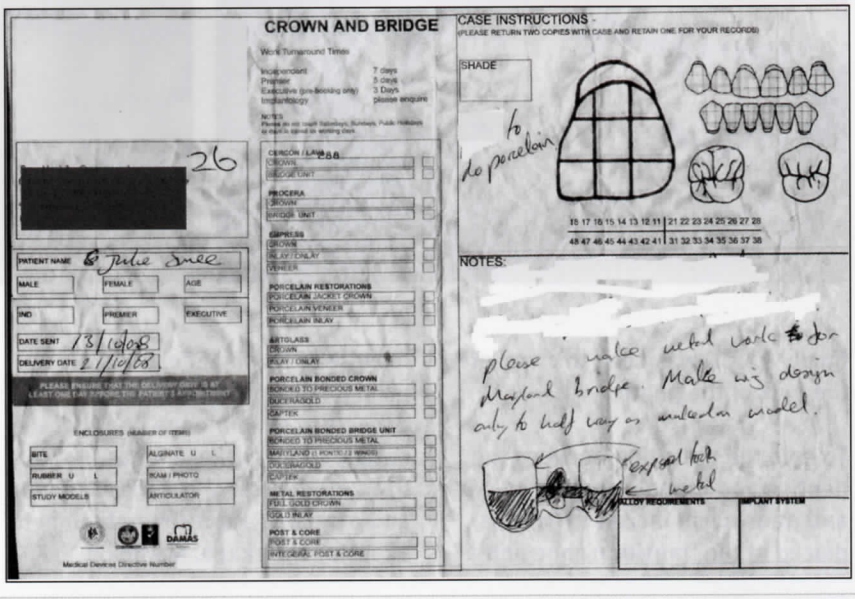


Figure 6: a-f – Smile: *Before (left) and after (right) images of the case*

finally A2.5 D was used to complete the bulk of the pontic.

To help the transition between the dentine and incisal, a mix of A2.5 D and translucent incisal 1 (TI1) was placed at the transition zone and a mixture of TI1 and Effect 15 were used on the mesial and distal aspects to simulate the depth of the natural tooth in these areas. TI1 was used for the rest of the incisal region and extended approximately 1mm to allow for shrinkage. Mamelon orange/yellow was placed over this in the incisal area.

On the palatal aspect a thin layer of Mamelon light was applied to the incisal edge to act as a light blocker and smooth the transition from the

metal frame to the incisal edge. A thin mixture of A3.5 DD and Occlusal Dentine Orange was used to complete the rest of the palatal area and to mask the underlying frame without creating too much bulk. This was then covered with TI1 and Opalescent Enamel 4 to complete the morphology. The build up was then fired.

The second build was used to simulate the enamel layer. Once the first build had been refitted to the model a small amount of A2.5 DD was placed under the pontic and compressed into place to complete the form of the pontic base. A thin layer of cervical translucent orange was placed at the neck for warmth, some bands of Opalescent 4 were placed in the middle and cervical thirds to simulate the white banding, and a mixture of TI1 and translucent neutral (TN) were placed over the rest of the build up. Some small amounts of pure TN were also added to the incisal mesial and distal corners. This was then fired at a slightly reduced temperature to avoid any further shrinkage of the previous build layer.

This two stage build up technique allows modification of any internal effects before the final enamel layer is applied, thus avoiding a complete restart of the ceramics should the internal effects need intensifying or reducing.

Once the pontic was fitted to the solid model and any shape modifications made, the surface was smoothed with a fine diamond and primary anatomy was created. A rubber wheel was then used to smooth the surface further and some fine secondary anatomy was carved in. Surface texture and anatomy were reproduced by using a texture map created in Photoshop and from the study of close up photographs and silver powder coated onto the model of the natural central.
Some stain was then applied to help accentuate the white banding in the

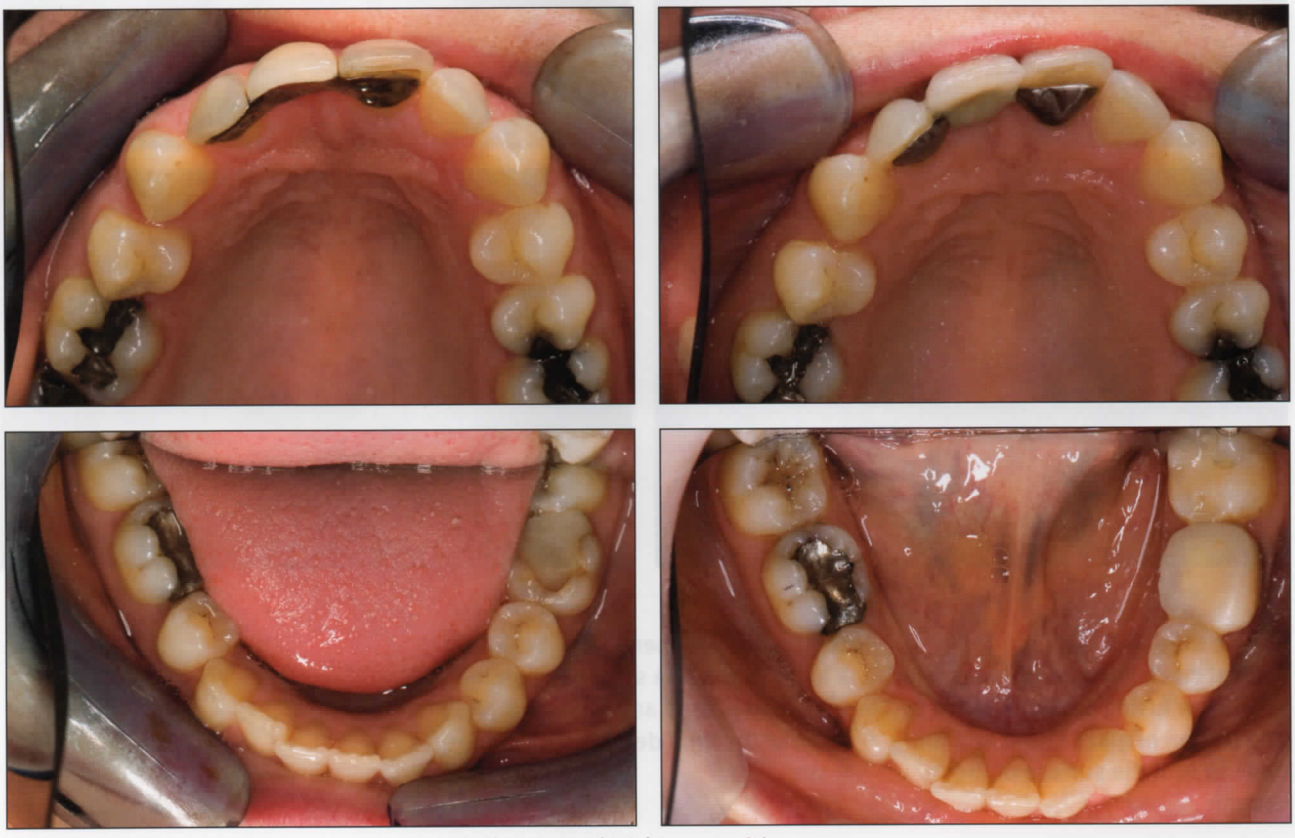


Figure 7: a-d – Upper and lower occlusal: *Before (left) and after (right) images of the case*

Figure 8: a-f – Retracted: *Before (left) and after (right) images of the case*

middle third and highlight the vertical crack line and this was fixed with a low fusing cycle, followed by application of glaze liquid and firing cycle to seal the surface of the ceramic.

The pontic was then lightly buffed on a lathe with a fine synthetic pumice to reduce plaque adhesion and achieve the final desired surface lustre.

Figure 9: a-f – Anterior: *Before (left) and after (right) images of the case*