

The creation of an emergence profile to improve the aesthetics of a conventional bridge in a high lip line case

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Introduction

The immediate and long term success of tooth-retained bridgework is dependent on several key factors:

- The periodontal health of the abutment and surrounding teeth
- The amount of sound tooth tissue remaining
- The design of the bridge
- The clinical skills of the dentist
- The skills of the technician in reproducing the natural tooth form, shape and colour of the adjacent natural teeth.

Whereas these factors may be sufficient when providing fixed bridgework where function and

aesthetics are straightforward, such as the low lip-line case or in the posterior segments of the mouth, there is another factor that needs to be considered when providing treatment for a high lip-line patient with high aesthetic demands. In these cases the success of the treatment provided is also dependent on the provision of the correct shapes and contours of the gingival tissues. The design of the pontic should be such that it helps create papillae, as well as ensuring that the height and contour of the gingivae are commensurate with and matching the adjacent natural teeth. Failure to consider the soft tissue architecture in these circumstances will undoubtedly result in an artificial appearance which would draw

attention even to the untrained eye. However, when correctly achieved, the abutments and pontics should be almost indistinguishable from the natural adjacent teeth.

The patient shown in *Figure 1* clearly demonstrates a case where these criteria were not met. Poor gingival margins are visible on the abutment teeth, the pontic tooth does not match the height of the contra-lateral central incisor and the overall impression is of artificial teeth. The closer view in *Figure 2* clearly shows the failing bridge, poor aesthetics related to the colour of the porcelain and the lack of normal tooth contours. There is an unsightly open embrasure and lack of papilla between the incisor pontic leading

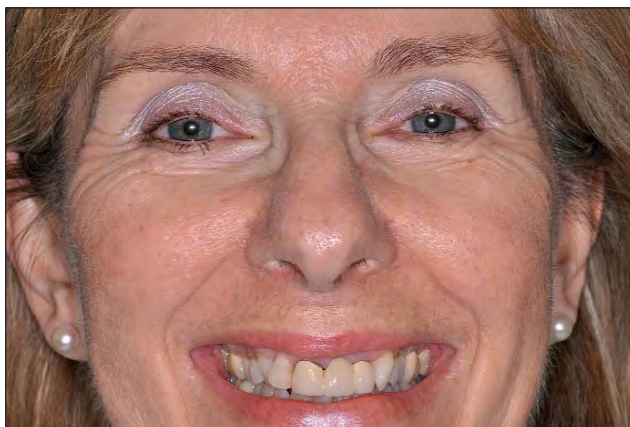


Figure 1: The patient on presentation



Figure 2: Pre-treatment intraoral view

Figures 3-4: Lateral views



to an unsightly black 'triangle'. There is also a failing discoloured composite on the mesial surface of the right lateral incisor. Finally, the flabby fraenum and the longstanding fibrosed sinus above the left central further complicate the aesthetics.

The close-up lateral views in *Figures 3 and 4* show recurrent caries as a result of a poorly fitting bridge. The 'ridge-lap' design pontic is 'sitting'

on the underlying gum rather than emerging from within the surrounding gingivae, giving an artificial appearance to the replacement tooth.

Case presentation

Treatment planning

The patient shown in *Figure 1*, having completed a course of

routine dental treatment, complained of the poor aesthetics associated with her anterior bridge and requested an opinion on the various options available to her to replace the failing restoration. Improved aesthetics were her priority. The various options available were discussed - namely the provision of an acrylic or metal-based denture, a new three-unit bridge or replacement of the missing tooth with an implant-supported crown and re-crowning the abutment teeth.

Impressions for study models were taken, along with face-bow records and appropriate radiographs. The models were mounted on a semi-adjustable articulator and the case analysed. Having considered the various options presented, and being satisfied with the function of the existing bridge, the patient opted for the provision of a conventional replacement bridge. The radiographic picture (*Figures 5 and 6*) showed adequate bone levels and healthy abutment teeth with no periapical pathology. There were no clinical or medical issues to contraindicate this proposed



Figures 5-6: The radiographic appearance of the bridge and abutment teeth

treatment. Although the design of the current bridge was unusual in that it was using a lateral incisor as an abutment, the bridge itself did not exhibit any excessive mobility. The authors were confident that a similar design would provide a predictable and long-lasting restoration.

The aesthetic issue of the pontic design was discussed with the patient and agreement reached to allow a minor surgical procedure to be undertaken to provide the initial emergence profile. The patient understood that the emergence profile would be created and developed with a provisional bridge which would be used for up to three months to allow the maturation of the gingivae following surgery. This bridge would be replaced with the definitive bridge fabricated with a metal-free design.

The acknowledged procedures to create an emergence profile are:

1. Use of pressure with a provisional restoration – this technique when

used with conventional bridgework is difficult as the pressure required to create the profile can lead to frequent de-cementation of the bridge. A series of visits are required and if stronger cement is used between visits to avoid the bridge loosening, there is always the risk of its fracture upon removal. This technique is better suited to screw retained implant supported short-span bridgework.

2. The use of electro-surgery to create the emergence profile – the drawback with this technique relates to the loss of tissue which

should be retained and used to create papillae.

3. The surgical approach – this involves the creation of an ovate pontic form in the temporary bridge, lifting a flap in the edentulous ridge area, ‘dropping’ the pontic into the sub-gingival space created and allowing the tissues to heal around it.

Regardless of the technique used there is one further consideration related to ovate pontic form. In the same way that conventional crown preparations should not invade the



Figure 7b: Palatal view of wax up



Figure 7a: Labial view of wax up



Figure 7c: Rigid vacuum formed stent

Figure 8: Clinical appearance upon removal of the bridge

biologic width, ovate pontic form requires its own biologic width to avoid chronic inflammation beneath the pontic. To ensure gingival health there should be 2.5-3 mm of gingival tissue between the porcelain pontic surface and the underlying bone³. Even if sufficient space exists between the pontic and the gingival tissue to allow cleaning with Super Floss (Oral B), chronic inflammation will always be present if this biologic width is invaded³.

In the case being presented, it is clear from the radiographs that there is sufficient soft tissue thickness available between the gingiva and the underlying bone indicating that it would be unlikely for osseous re-contouring to be necessary as part of the surgical procedure. It is important to realise that this tissue thickness should be confirmed at the time of ridge preparation and the technique adapted to include osseous re-contouring if necessary. It was also pointed out to the patient that there was residual fibrous tissue in the buccal mucosa remaining from an old discharging sinus associated with the extracted upper left central as well as a fleshy

prominent fraenum. The patient agreed to have these removed at the same time as the creation of the emergence profile.

Clinical procedure

Alginate impressions (Palgat Plus, ESPE) were taken and poured to give working models. As the case would require the chairside fabrication of a temporary bridge a diagnostic wax-up was carried out on the upper model to re-define the bridge contours and thicken the palatal aspects of the existing pontic to allow the provision of an ovate design at the time of the surgical procedure (*Figure 7a-b*). The authors' preference in cases such as this is for the chairside temporary bridge to be constructed using a rigid suck-down stent (Proforma) as shown in *Figure 7c*.

Local anaesthesia was administered and the existing bridge sectioned and removed. *Figure 8* shows the clinical picture, particularly the low fleshy fraenal attachment which unless removed would compromise the final aesthetic result.

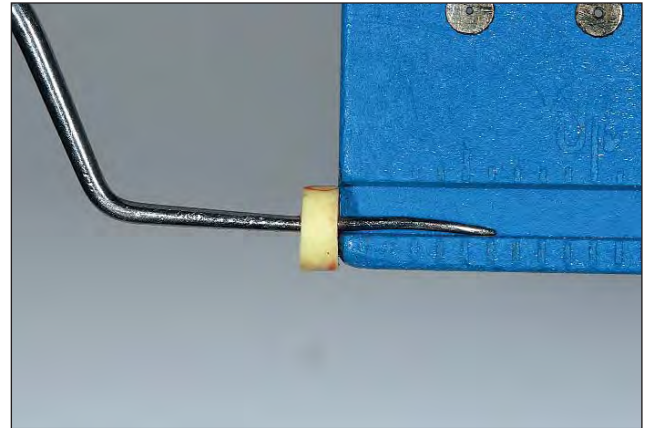
Figure 9: The available ridge

Figure 9 shows the edentulous ridge following minimal re-shaping and caries removal from the abutment teeth. There is some residual sub-lingual calculus on the mesial surface of the lateral incisor which was root-planed. The ridge shows adequate width mesio-distally, ample attached gingivae and the authors' opinion was that neither osseous nor soft tissue grafting was necessary to achieve the desired aesthetic result.

As mentioned previously, although there appeared to be an adequate thickness of gingival tissue in the edentulous area, it was decided to carry out bone sounding to confirm the radiographic evaluation. The authors prefer the use of a slightly blunt probe for the procedure to avoid accidental penetration of the underlying bone which would distort the true thickness measured. *Figure 10a* shows the bone sounding clinically and depth measurement with a rubber stop. The available gingival thickness measured 6mm (*Figure 10b*).

The preformed stent to be used to fabricate the temporary bridge was painted with a separator (Slaycris),

Figure 10: a-b – Bone sounding and measurement of the available gingival thickness



filled with a temporary crown and bridge material, Protemp Shade A2 (3M ESPE), and fitted in the mouth until fully set. The bridge is shown after trimming and polishing (Figure 11a) and trial fitted in the mouth (Figure 11b). It is clear that the bridge is an improved copy of the original in that it still shows open embrasures and a ridge-lap pontic design.

The next step was to convert the ridge-lap pontic (Figure 12a) to an ovate design. This is achieved by applying composite activator to the fit surface of the pontic, air drying after 20 seconds and applying All

Bond (Bisco) and light curing for 20 seconds. Venus Shade A3 (Heraeus Kulzer) composite is moulded to the prepared area to increase the height of the pontic by 3mm (the 6mm of gingival thickness present minus the desired 3mm necessary to maintain the biologic width discussed previously) and to reshape it to an ovate design. Once the correct form is achieved it is light cured for 40 seconds. The surface is then trimmed with discs (Soflex – 3M ESPE) and polished with rubber wheels (Shofu) and impregnated brushes (Occlubrush – Kerr). The completed pontic is shown in

Figures 12b-c. The darker shade is used to allow differentiation between the original bridge and the new additions.

On refitting the bridge in the mouth, the bulk of composite added during the conversion to an ovate pontic does not allow full seating (Figure 13). The gap between the bridge margin and the margins of the preparations should not measure more than the desired 3mm. If the height measured is greater, then the fit surface of the pontic has to be reduced until the correct dimensions are achieved.



Figure 11: a-b – The temporary bridge after trimming and polishing and trial fitted

Figure 12: a-c – Conversion from ridge lap to ovate pontic



With the bridge correctly prepared the minor surgical procedure can now be undertaken. The authors prefer to make the incision to the bony crest, using a No 15 scalpel blade, to be placed palatal to the midline of the ridge (*Figure 14a*) with relieving incisions both mesially and distally avoiding the existing the papillae (*Figure 14b*). Minimal labial and palatal flaps are then raised by gentle pressure with a thin periosteal elevator (*Figure 14c*).

If the flaps are simultaneously reflected a 'hole' should exist for the pontic to fit into. If the ovate pontic is correctly designed a perfect fit of

the bridge should be achieved. At this point, the distance between the pontic and the underlying bone should be checked from the palatal aspect to ensure that the desired 3mm space is present. If the gap present is less than 3mm the bridge should be removed and adjusted accordingly until the correct space is created (*Figure 15*).

To maintain the excellent aesthetics of the bridge, it is cemented with TempBond Clear (Kerr) rather than the whiter normal temporary cements, such as original TempBond (Kerr) which have a tendency to show through the thinner sections of

the temporary bridge. Other useful properties of the clear material are easy removal of the bridge at follow-up appointments and its easy removal from the fit surface of the bridge and the abutment teeth. In this case, as a final step, the fleshy fraenum and fibrous projection of the old healed sinus tract were excised with electrosurgery.

The use of a periodontal pack such as Coe-Pak (GC) is unnecessary. The patient is instructed to avoid brushing at the surgical site and to rinse twice daily with a mouthwash – Corsodyl (GSK) until the review appointment one week later.



Figure 13: The modified bridge on re-fitting

On review the patient reported only mild post-operative discomfort and no swelling after the procedure. The rapid healing is self-evident (*Figures 16a-c*). At this point, as the embrasures were still wide open showing black 'triangles' both mesially and distally, the design and shape of the pontic was altered with the further addition of composite mesially and distally at subgingival level in order to apply pressure in the interdental area. This pressure compresses the papillae and stimulates them to fill the space available interdentally on the bridge. The use of Corsodyl Mouthwash was extended for a further week.

Figure 14: a-c – The surgical steps



The elimination of the black 'triangles' at one month recall is self-evident (*Figure 17a*). The gingival tissues in the pontic area are still lacking maturity but the shape of the emergence profile is beginning to develop (*Figure 17b*). Excessive addition of composite at the distal area of the pontic had over compressed the papilla and so this area was marginally reduced in bulk to allow greater space for re-contouring. Mesially, some composite was added to further compress the papilla to reduce its width and increase the height (*Figure 17c*).

The case is shown at 10-week review. The papillae have started to infill the embrasures created and have better contours. The gingiva in the pontic area has matured further (*Figures 18a-b*). To encourage further tissue maturation in the pontic area, the patient was shown the use of Super Floss (Oral-B). The ovate pontic design allows easy passage of the Super Floss between the pontic and the underlying gingivae (*Figure 18c*). The patient was encouraged to try to keep some finger pressure on the incisal tip of the bridge so as to avoid accidental dislodgement.

Figure 15: The temporary bridge fully seated



Figure 16: a-c – The tissues at 1 week review



At this recall appointment it was also considered that the gingival tissue above the pontic was too high in comparison the adjacent central incisor. In the same way that the shape and height of the papillae can be influenced by adding or reducing the width of composite in the interdental area, so too can the height of the gingivae buccally. If the height of the gingiva is to be raised composite should be added buccally, if lowered then the thickness should be reduced. A useful tip is drawing a pencil line at the gingival margin with the bridge in place. Additions or reductions should only take place above this line. In this case the buccal thickness that is situated under the gingival tissue was reduced and blended to avoid altering the existing interdental contours.

The tissues at 13 week recall show excellent maturity (*Figure 20a*). The inability to completely eliminate some superficial inflammation in the pontic area (*Figure 20b*) is related to the inability to leave the fit surface of the pontic area completely porosity free. A check radiograph can be taken to confirm that adequate space exists between the pontic and the underlying bone and that the biologic width has not been encroached upon (*Figure 20c*). It was felt that the emergence profile could not be improved further and appointments were made for the final impressions to be taken.

The impression technique to reproduce the emergence profile created has been described in detail elsewhere.⁴ It is important to recognise that the emergence profile

Figure 17: a-c – Healing at 1 month review

is only maintained as a result of the pressure created by the shape of the pontic. Once the bridge is removed the profile starts to collapse and is further distorted by the placement of retraction cord around the abutment teeth. Two impressions need to be taken. The first should be taken with the specially created stent and prior to the use of retraction cord to ensure that the soft tissues are undistorted in the final working model (*Figure 21a*). The second is a conventional working impression following placement of the retraction cord (*Figure 21b*). Impregum Penta Soft (3M ESPE) was used with both impressions.

Figures 22a-b clearly show the completely distorted clinical picture of the soft tissues after the final impression was taken and compared to the beautifully created emergence profile. Providing the technician with this altered tissue profile as the sole working model would completely negate the effort taken to produce it in the first place. Careful adherence to the technique, as described, will ensure that the fabricated definitive bridge will faithfully and passively reproduce the necessary contours to maintain the desired final appearance.

For the fabrication of the definitive bridge, the working model with removable dies (FujirockEP - GC-EUROPE) was scanned using a 3M-ESPE LavaScanST laser scanner to produce the Lava Zirconia framework (3M-ESPE). This in turn was veneered with GC-Initial ZrFS ceramic (GC-EUROPE).



Figure 18: a-c – 10 week recall



The final aesthetic result is shown in the before and after views of the case (Figures 23a-b). The appearance is natural and was further enhanced by some tooth whitening during temporisation and the addition of some bonded composite [Venus (Heraeus Kulzer)] to the mesio-incisal aspect of the right lateral incisor in order to optically upright the tooth and further improve the harmony of the aesthetics. The gingival heights are harmonious and blend seamlessly with the natural teeth. The appearance achieved is natural.

Conclusion

A technique to create an emergence profile is described in a difficult high lip-line aesthetic case where the cosmetic result achieved was of paramount importance. Reference is also made to the impression technique required to reproduce the

Figure 19: a-c – Pencil line to define area for reduction



Figure 20: a-c – 13 week recall



created emergence profile. Although time consuming, the authors feel that the steps taken in the initial preparation of the tissues are well worth the effort. Attention to this preparation ensures that, with the impression technique described, the fabricated bridge will fit accurately and predictably and avoid numerous and frustrating time consuming alterations to the porcelain at the try-in stage of treatment.



Figure 21: a-b – Soft tissue and conventional impression

Figure 22: a-b – The tissues pre and post conventional impression



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Figure 23: a-b – Recall at 18 weeks – before and after appearance