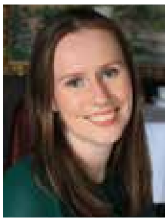

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Immediate Natural Tooth Bridges

Abstract: This article describes four cases in which immediate natural tooth bridges have been provided. Four different techniques are described for creating these. The four different retainer types discussed are silanated glass fibres impregnated with PMMA and bis-GMA, laboratory-made metal wings, metal mesh and mesh-type titanium wire. With the support of photographs and diagrams, the techniques for each retainer type are described. The final section of this article discusses the factors that affect the prognosis of immediate natural tooth bridges. Providing information on prognosis is an important part of the consent process; this includes patient factors and clinician factors.

CPD/Clinical Relevance: This article details four different techniques for creating immediate natural tooth bridges. It also discusses the important factors to consider for the prognosis of immediate natural tooth bridges.

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With the loss of an anterior tooth, psychosocial, aesthetic and functional issues can arise, and patients may not wish to leave anterior spaces unrestored for any length of time. The options for restoring anterior spaces immediately following an extraction are with a denture, bridge or dental implant. Many patients exhibit a preference for a fixed prosthesis rather than a removable denture.[1,2] Immediate implants are not appropriate for all cases and immediate loading may also be unsuitable; this option is case specific.[3,4] In any case, it is normally best to allow time for healing with bone and soft-tissue remodelling prior to the provision of a definitive fixed prosthesis.

Immediate natural tooth bridges can provide a quick, fixed and aesthetic solution for loss of a single anterior tooth. These are also minimally invasive and can be fully reversible. There are case reports in the literature detailing different approaches to immediate natural tooth bridges. This includes cases describing traumatized teeth and periodontally involved teeth.[5-9] This case series compares different retainer types for immediate natural tooth bridges. The factors affecting the prognosis of these restorations will also be explored.

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Cases

The cases described in this paper illustrate the different types of retainer that can be used with immediate natural tooth bridges: silanated glass fibres that are impregnated with PMMA and bis-GMA, laboratory-made metal wings, metal mesh and titanium wire.

Case 1

A 28-year-old male presented with localized severe recession and recurrent infection at LL2. He had no relevant medical history. On examination there was severe recession at the buccal aspect of LL2. This tooth was not mobile but there was a fixed retainer present from LR3 to LL3. He had generalized deep pocketing and recession. Radiographic examination showed severe bone loss at LL2 (Figure 1). The diagnosis for LL2 was combined endodontic-periodontal lesion.[10] The treatment for LL2 was extraction and replacement with an immediate natural tooth bridge using silanated glass fibres that are impregnated with PMMA and bis-GMA (everStick®, StickTech, Turku, Finland) as a retainer.

A putty stent (Express 2®, 3M ESPE, Seefeld, Germany) was made so that the original tooth position could be maintained. LL2 was extracted under local anaesthesia and shaped to form a pontic, in the manner described in Figure 2. The a

b

Figure 1. (a, b) Case 1: Pre-extraction view and radiograph.

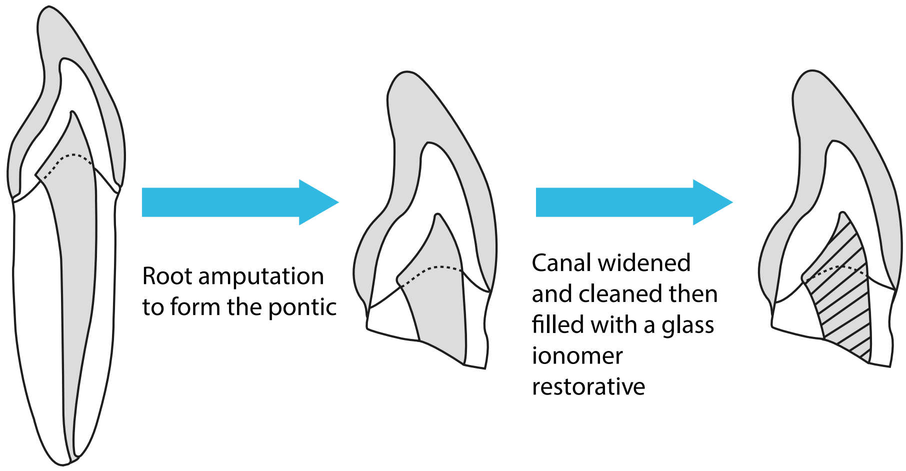

Figure 2. Case 1: The process of creating the natural tooth pontic.

Figure 3. Case 1: Immediately post-cementation of natural fixed-fixed tooth bridge.

amount of pre-operative supra-gingival tooth tissue, the final aesthetic outcome and the desired pontic design determines how much of the root is resected.

Latex-free dental dam (UnoDent®, Essex, UK) was used for moisture control and isolation. The putty stent was used to help reposition LL2 in the arch. EverStick fibres (everStick®, StickTech, Turku, Finland) were then used with an adhesive and flowable composite combination to create the lingual retainer. This technique is described in more detail later in the article. The immediate post-operative appearance is shown in Figure 3.

This technique is similar to that described in a number of case reports, including one by Auplish and Darbar.[6] Kermanshah and Motevasselian reported a similar technique but prepared the abutment teeth to create space and for retention of the composite fibres.[7] The authors do not advocate any tooth preparation as this is considered unnecessary with an adhesive technique. The abutment teeth in this case were therefore not prepared other than for scaling and polishing of the fitting surfaces. Bonding was undertaken in accordance with the directions for use recommended by the manufacturer of the adhesive system. Bonding to enamel with all-in-one and etch-and-rinse systems achieves high values, with the latter achieving the greatest microshear bond strength.[11-14]

The series of photographs in Figure 4 illustrate this technique using plastic typodonts (Frasaco GmbH, Tettnang, Germany) in which Figure 4a represents a pre-extraction stage. The first step was to create the putty stent (Figure 4b). The tooth was then removed from the model, simulating the extraction. A line drawn on the tooth root illustrates the planned root resection level (Figure 4c). After the root was resected, the pontic tooth was contoured to optimize cleansibility. The pontic (Figure 4d) was then prepared with a large diamond bur to remove the pulpal contents and create a cavity that was subsequently filled with a glass-ionomer material (Figures 4e, f). Rubber dam was applied, taking care that it was not taut across the pontic space, in order to allow the pontic to seat fully. The pontic was then held *in situ* using the putty stent (Figures 4g, h). The initial stage of cementation requires the 'tacking down' of the tooth in the correct position by means of the stent and with the aid of a small amount of labially placed resin-based composite; in this case the authors used Esthet-X® (Denstply, Milford, USA). Note that the 'tacking down' composite was placed on the labial surface and interproximally without etching/bonding (Figure 4i). Dental floss is useful to measure the length of fibres required (everStick®, StickTech, Turku, Finland). The everStick® fibres were then used to create the lingual retainer with an adhesive and flowable composite combination (Figure 4j). Further flowable composite was then applied (Figure 4k). The labial composite and rubber dam were subsequently removed. Finally, the composite retainer was contoured and polished (Figures 4l, m).

Case 2

A 39-year-old female presented with a history of trauma and repeated infections at LL1, a tooth which had previously been root-canal treated. On examination, there was no evidence of

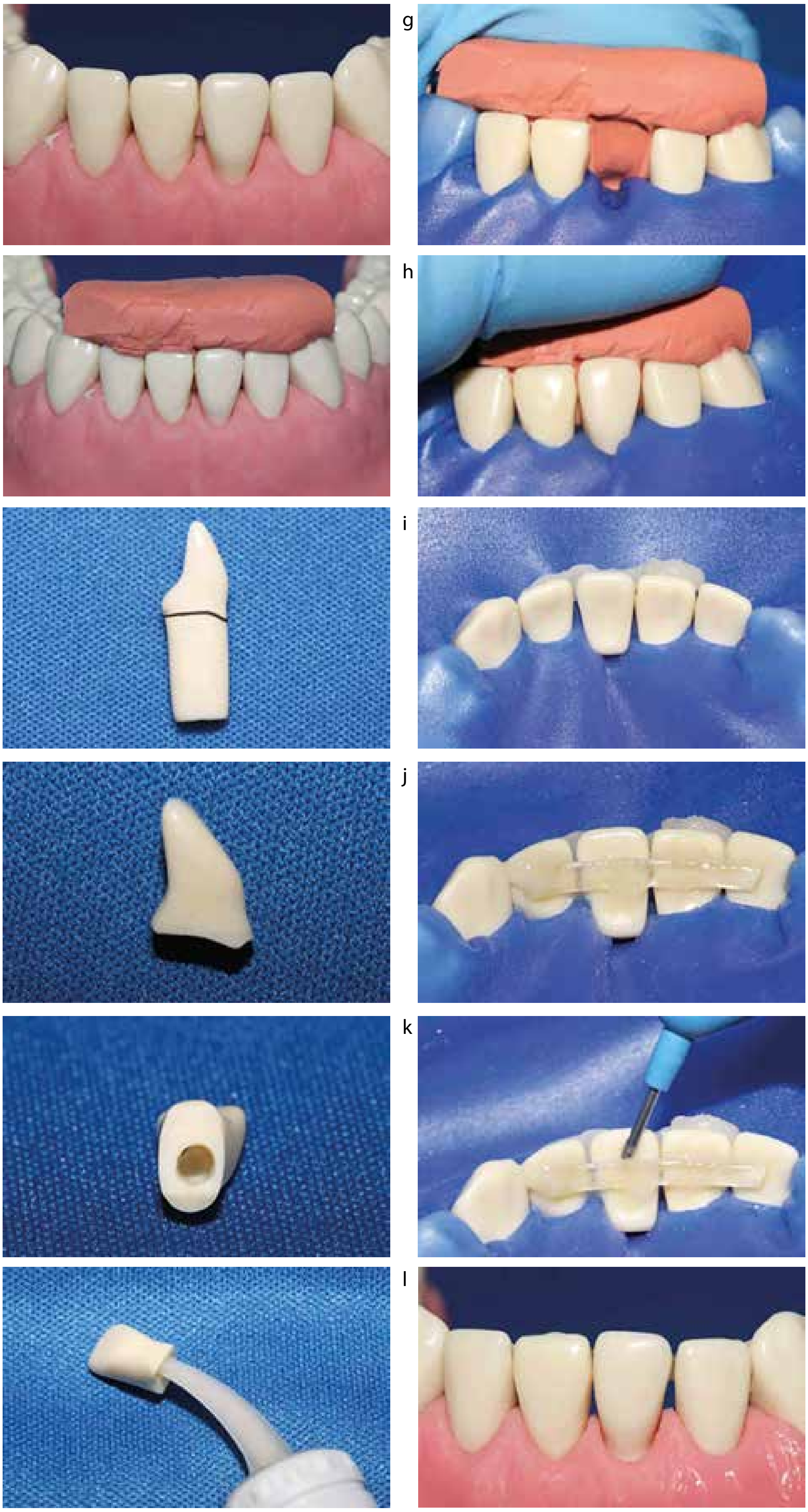

Figure 4. (a–m) Case 1: Steps to create a temporary natural tooth bridge with a composite fibre retainer shown with typodont plastic teeth.

a draining sinus or mucosal swelling. Radiographic examination revealed a periapical radiolucency associated with the the root-treated LL1 (Figure 5). An apicectomy without a retrograde root filling had been performed in the past. A diagnosis of chronic periapical periodontitis was given. The prognosis for this tooth was deemed to be hopeless, based on the compromised status of the root, the persistent infection and the previous attempts of ortho- and retrograde root canal treatment. The treatment plan for LL1 was extraction and replacement with an immediate natural tooth fixed-cantilevered adhesive bridge using a laboratory-made metal wing (TiLite®, Talladium, CA, USA) as a retainer from the adjacent LR1. LL2 had previously been replaced with a resin-bonded bridge from LL3.

A silicone impression was taken to fabricate cast metal retainer wings for LR1 (abutment) and LL1 (pontic), as shown in Figure 6. LL1 was extracted under local anaesthesia and shaped to form a pontic, in the manner described in Figure 2. The tooth had been obturated, so the existing gutta percha was removed and, after cleaning, it was restored with glass ionomer (Fugi IX Extra®, GC, Tokyo, Japan). After etching the tooth surfaces, the metal retainer was cemented to the LR1 abutment tooth and the extracted pontic crown with a resin cement (Panavia 21®, Kuraray Medical Inc, Japan) (Figure 7). This technique is similar to that described by Darbar, Hemmings and King.[15] It involves a laboratory stage and laboratory costs but was less technique sensitive and relatively straightforward to carry out in

Figure 5. (a, b) Case 2: Pre-extraction view and radiograph (LL1).

Figure 6. Case 2: Cast metal retainer lingual wings for LR1 (abutment) and LL1 (pontic).

Figure 7. Case 2: Three weeks post-cementation of the natural fixed-cantilevered tooth bridge retained with cast lingual wings (shown in Figure 6)

Figure 8. (a, b) Case 3: Pre-extraction view and radiograph.

Figure 9. (a, b) Case 3: Sixteen weeks post-cementation of a natural fixed-fixed adhesive tooth bridge.

comparison with the technique described for Case 1; with the added advantage of retaining the appearance of the natural dentition.

Case 3

A 44-year-old female presented with pain and swelling related to UR1. On examination, there was generalized deep pocketing and recession. UR1 was supra-occluded. Radiographic examination showed severe bone loss around the root of UR1 (Figure 8). The diagnosis for UR1 was periodontal abscess with a hopeless prognosis. The treatment plan for UR1 was extraction and replacement with an immediate natural tooth bridge using a metal mesh as a retainer.

A putty stent was not used in this case as treatment involved altering the position of the tooth in order to achieve an aesthetic result. UR1 was extracted under local anaesthesia and shaped, cleaned and filled to form a pontic (Figure 2). The metal mesh was measured and cut appropriately. Flowable composite (X-Flow®, Dentsply, Milford PA, USA) was used in combination with the metal mesh to create the retainer (Figure 9). The embrasures were cleared of excess cement and contoured using fine finishing diamond burs in a high-speed handpiece. The whole pontic area was checked for sharp edges from the metal mesh and polished accordingly.

The series of photographs in Figure 10 illustrate this technique. A putty stent was used in this technique; which was useful when trying to replicate the exact position of the pontic. The adjusted putty stent rested on the palatal tissues and teeth, achieving a firm seated position (Figure 10a). The UL2 tooth was removed from the model, replicating a clinical extraction. A line drawn on the tooth root illustrates the planned root resection level (Figure 10b). Following resection, the pontic tooth was prepared and cleaned as previously described (Figure 2) with the completed restoration shown in Figure 10c. Dental dam was applied in a loose manner, to allow positioning of the the putty stent and the pontic crown *in situ*. Composite was then placed labially (no etch and no bond) in order to retain the pontic in position temporarily (Figures 10d, e). Metal mesh (Figure 10f) was then trimmed and contoured to form a retainer (Figure 10g). Small amounts of composite (combination of flowable +/- restorative) were placed incrementally to bond the mesh *in situ* (Figures 10h, i). The temporary buccal composite retainer was then removed. The composite around the metal mesh was contoured and polished ensuring that no sharp edges remained.

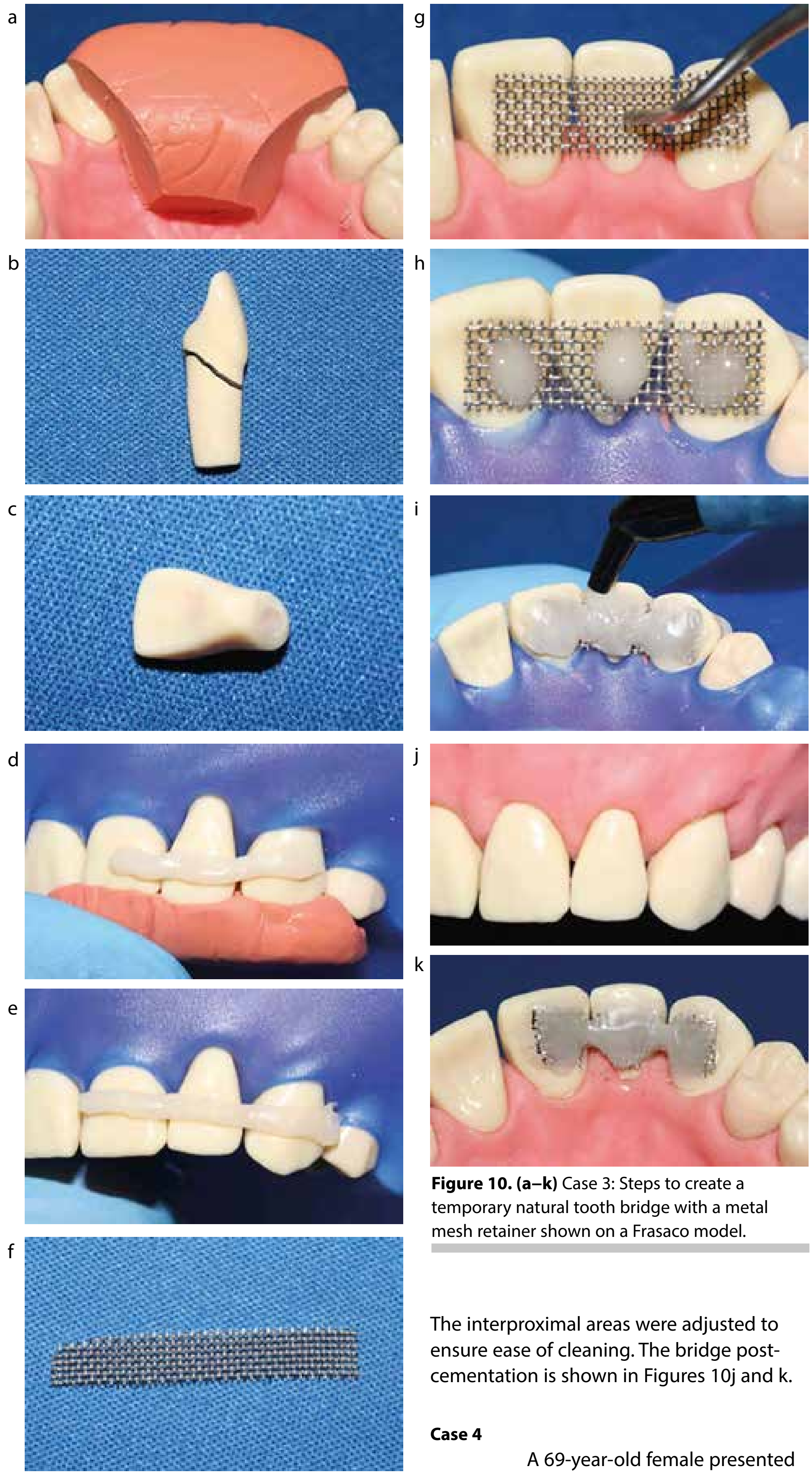

Figure 10. (a–k) Case 3: Steps to create a temporary natural tooth bridge with a metal mesh retainer shown on a Frasaco model.

The interproximal areas were adjusted to ensure ease of cleaning. The bridge post-cementation is shown in Figures 10j and k.

Case 4

A 69-year-old female presented with mobility of the LR1 and a draining sinus. Clinical examination confirmed that the LR1 was grade II mobile with a lingual draining sinus between the LL1/LR1. Radiographic examination revealed severe bone loss affecting the lower incisors, with almost 100% bone loss on the mesial aspect of LL1 and LR1 (Figure 11). The diagnosis of chronic periapical abscess LL1/LR1 was reached with a hopeless prognosis. The treatment plan was extraction of LL1 and LR1 and replacement with a natural tooth bridge using titanium wire as a retainer. LL1 and LR1 were extracted under local anaesthesia and shaped to form pontics by reducing the width and thus bringing them back into the line of the arch. The crowns were was cleaned and filled as described in Figure 2. A mesh-type titanium wire (Titanium Trauma Splint® 100x0.2 mm, Medartis AG, Basel, Switzerland) was then splinted across the two LL1, LR1 pontics to the abutment teeth LR23, LL23. Flowable composite (X-Flow®, Dentsply, Milford PA, USA) was used in combination with the titanium wire to create the retainer. This was polished and contoured to allow for interproximal cleaning. (Figure 12).

Prognosis

Part of the consent procedure includes informing patients how long their restoration is likely to survive. Results of a review article have concluded that laboratory-made resin-bonded bridges have an 87.7% success rate at 5 years.[16] Factors influencing the success of immediate natural tooth bridges are different. These can be thought of in terms of the clinical factors and patient factors.

The clinician's experience and skill is important for the execution of these techniques. Moisture control is important with all composite adhesive materials/techniques and therefore rubber dam isolation may be preferable. This is especially true immediately post extraction when maintaining a dry isolated field may be challenging. It may be that larger amounts of dam need to be left between each tooth so that the dam remains loose (Figure 13).

Surface area is another significant factor, particularly in the lower incisor regions where teeth may be small; prognosis is improved by having 180

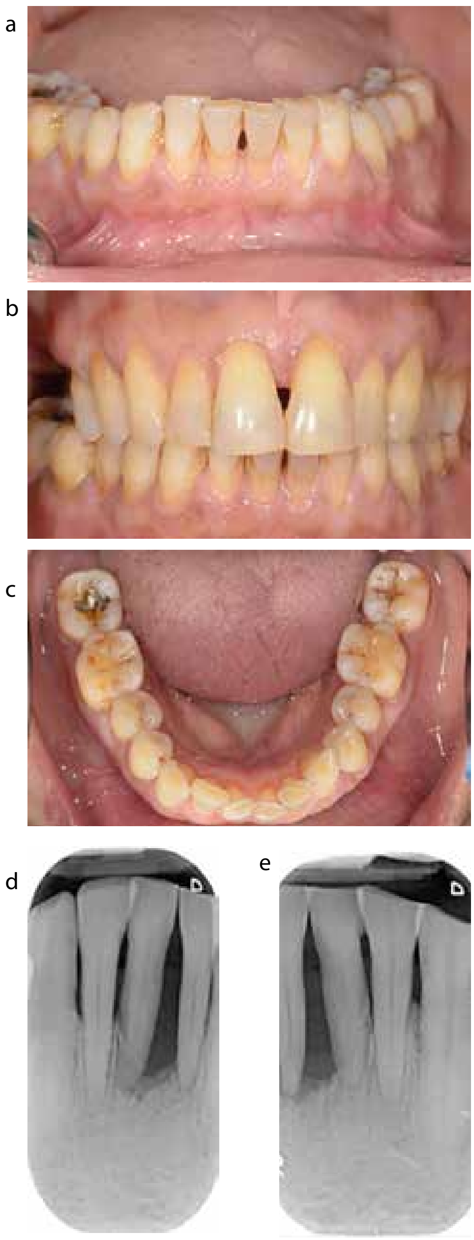

Figure 11. (a–e) Case 4: Pre-extraction views and radiographs.

degree wraparound of the abutment tooth.[17] Enamel quantity and quality will also play a part in the success of the bond.

Another prognostic factor is the quality of the materials; good quality materials will improve prognosis. For example, for laboratory-made retainers, good quality resin cements will give restorations a better prognosis compared with other cement types.[17]

A decision needs to be made whether the occlusal relationship that exists prior to the extraction is maintained or whether it should be changed. If it is maintained, pre-extraction models are important and a putty index can be utilized. If there is fremitus prior to the extraction, then it is likely that it would be advantageous to alter the occlusal relationship. In Case 3, the occlusal relationship was altered. Bruxism is also cited in the literature as a negative prognostic indicator for these restorations.[7,9]

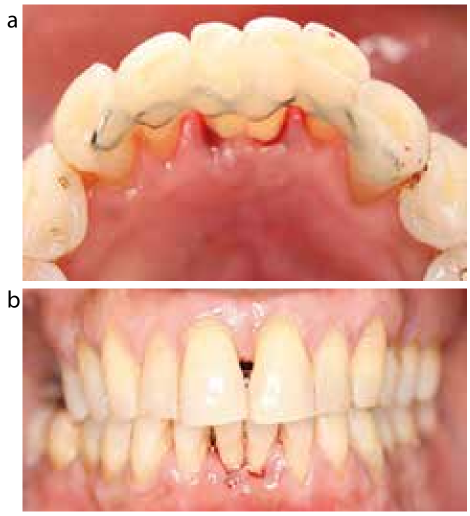

Figure 12. (a, b) Case 4: Immediately post-cementation of a double-pontic fixed-fixed adhesive bridge.

Figure 13. Larger amounts of dam between the teeth so that the dam remains loose.

Design of the immediate bridge will also contribute to its success. Pontic design should allow for optimum aesthetics and allow for the maintenance of good oral hygiene. A modified ridge lap pontic design will fulfil these criteria in most clinical scenarios.[18] With regards to retainer design, if a fixed-fixed design is employed (as in the composite fibres case) there is a risk of secondary caries underneath the retainer not being noticed. Surface area of the retainer has previously been mentioned as an important design factor.

There is some debate in the literature with regards to tooth preparation for resin-bonded bridges. A study by King *et al* showed that tooth preparation was a negative predictor for success of laboratory-made resin-bonded bridges.[19] The restorative status of the abutment(s) will also affect prognosis. Restorations can be a negative predictor of prognosis, but sometimes the cavities can be used to aid with mechanical retention.[17]

The main difference between an immediate natural tooth bridge and a laboratory-made one is that the pontic is a natural tooth and therefore a biological structure. This means that it is vulnerable to caries in a way that laboratory-made bridges are not. It is important that patients attend for regular professional maintenance and keep a high standard of oral hygiene if they want their natural tooth bridge to have a good prognosis.

Immediate natural tooth bridges can provide either an interim or a definitive restoration. This is case specific and depends on the factors outlined above, as well as the prognosis of the abutment teeth. For example, the abutment teeth in Case 3 have severe bone loss, but the immediate natural tooth bridge provides an interim solution whilst the patient's overall periodontal prognosis can be assessed. Using a patient's natural tooth can be a pragmatic solution when other options are not clinically or financially viable.

Conclusion

These cases demonstrate successful aesthetic outcomes for the patients involved. Attempts made to control clinical factors and patient factors were discussed as part of each patient's treatment. Whilst the laboratory-made metal wing is the most straightforward technique to execute, it incurs laboratory costs that the other two techniques do not. It may, however, be the most appropriate technique. An example of this would be if the patient had interproximal spacing such that a retainer would be visible labially with a fixed-fixed design.

If all clinical factors are accounted for and controlled as much as possible, prognosis relies heavily on patient-driven care and maintenance. This is therefore an important part of the consent process.

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