Implants in the aesthetic zone

Are provisional restorations always necessary?

At the advent of modern implant dentistry as we have come to know it, screw-form endosseous implants were inserted into the mandible and ultimately used to support a mandibular fixed full arch prosthesis. The emphasis and focus of treatment was predominantly associated with patient function and wellbeing, with implant-supported restorations serving as an alternative to a mandibular complete denture.

In the current era, implant dentistry has evolved to become a highly diverse and hugely effective treatment option for the management of both single and multiple missing teeth in both the maxilla and the mandible. However, the fundamental difference that clinicians now face – which is in stark contract to that of the early pioneers – is that of patient demands and expectations. It is no longer acceptable to provide patients with restorations that are simply functional. Indeed, over the last decade, there has been such a strong focus on achieving aesthetically pleasing outcomes, that scoring methods for both ‘white’ and ‘pink’ aesthetics have been developed against which to measure our clinical outcomes (1,2). With the aim of achieving aesthetic ‘perfection’, considerable emphasis has been placed on providing the patient with a provisional restoration as the first step in the restorative sequence. Understandably, many clinicians still believe that a provisional restoration is mandatory when restoring implants in the aesthetic zone. However, the evidence does not always support this as being advantageous in the long term (3). With a lack of clarity in the dental literature, this paper explores the concept of whether a strict adherence to treatment procedures and protocols is always necessary, or whether some flexibility may allow for more effective and appropriate patient management.

The evolution of implant placement in the aesthetic zone has led to the development of certain guidelines regarding the optimal position of the implant. These recommend that the collar of a bone level dental implant should be placed no closer than 1.5mm to an adjacent tooth and no closer than 3mm to an adjacent implant (4). These recommendations were based on the understanding that an area of bone sauceration will develop around the collar of a bone-level implant in order to establish a ‘biologic width’ (5). By maintaining an appropriate distance from adjacent teeth and/or dental implants, there is a significantly reduced risk that bone sauceration will result in the loss of all the interproximal bone peaks. It is also recommended that, during implant placement, the direction of the long axis of an implant should not extend further facially than the planned incisal edge of the proposed restoration. Ideally, it should emerge in the cingulum region of the tooth to allow for screw retention. In this way, the osteotomy preparation will carry a considerably lower risk of jeopardising any buccal bone that may be available. These recommendations are important because the literature has confirmed that the level and position of the underlying bone will ultimately determine the long-term resting position of the peri-implant soft tissue and the proximal papillae peaks (6,7). If the three-dimensional placement of a dental implant respects these clinical recommendations, when the implant is ultimately restored, it is relatively straightforward to fabricate a crown with a gently concave emergence profile, especially on the facial aspect. This in turn will result in considerably less apical pressure on to the soft tissues, which should contribute towards preventing recession. By controlling the apical location of the proximal contact points in relation to the carefully preserved proximal bone crests, the redevelopment of virtually all the lost proximal soft tissue peaks is highly likely. It is also well accepted that the ideal position of the head of the implant should be approximately 3mm apical to the planned gingival margin, supposedly to allow for adequate ‘biologic width’ at the level of the peri-implant mucosal cuff, but more credibly to allow for suitable vertical space to create a smooth, gentle emergence profile of the crown as it emerges from the mucosa.

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Figure 1: Pre-operative view of a patient referred for replacement of tooth 11 with an implant supported crown. Extraction of the natural tooth was associated with loss of proximal soft tissue as a result of loss of proximal bone. Fortunately, this patient had low upper lip mobility. The benefit of using of a provisional restoration in this case is arguable.
Developments in implant design and implant-abutment connections including platform switching (8) and conical connections have claimed to reduce the extent of horizontal bone loss that was historically seen around the collar of an implant after it was uncovered. This has now led to a re-evaluation of the classical guidelines regarding implant placement. Recent data demonstrates that implants can be positioned significantly closer to adjacent teeth and/or implants, while still preserving the septal bone and therefore the proximal papillae (9). Of course, in the highest risk, most aesthetically demanding cases, such as patients who have very thin tissue biotypes and high upper lip mobility, it would seem prudent to revert back to those original recommendations. However, based on current evidence, should we still be providing provisional restorations for every patient who requires an implant restoration in the aesthetic zone?

It seems apparent that if an implant is inserted into the ideal position and the volume of bone and soft tissue is maximised at the time of surgery or thereafter, a favourable outcome with regards to ‘pink’ aesthetics of the soft tissues is highly likely to be expected, irrespective of whether or not a provisional restoration has been used. What then do we have to gain from using a provisional restoration in relatively straightforward cases involving single tooth replacement in the aesthetic zone? Indeed, it is now well accepted that over time the tissues will arrive at a favourable position as long as the support of the bone scaffold is available, irrespective of the technique and timing of implant placement (3,4). Should our time and efforts as clinicians not be better spent in a closer collaboration with our technicians to develop a mutual understanding regarding contours, emergence profiles and the optimal form of the planned restorations? Indeed, how often does a provisional crown fabricated by a skilled master technician who understands dental morphology actually need any adjustment when it is used to restore an optimally positioned implant? If we provide a skilled technician with the optimal implant position and bone support, do we really need to subject our patients to additional treatment stages? Moreover, are we actually doing a disservice to our perfectly crafted soft tissues, and possibly promoting additional soft tissue recession and crestal bone loss during the provisional phase? It is well accepted that a soft tissue mucosal response is optimal when exposed to ceramic materials, whereas acrylic or resin-based materials are more likely to elicit inflammatory reactions due to the porous and plaque-retentive nature of the material. There is also a body of evidence that has suggested that the more frequently components are removed and replaced from the implant head, the greater the chance of mucosal recession and bone remodelling occurring (10).

Figures 4–6: A patient referred for remedial treatment to manage a poor aesthetic outcome following their original implant treatment. The implants have been positioned too far towards the facial aspect, with associated loss of buccal bone and subsequent soft tissue recession. The adverse effects of implant placement have been compounded by a poorly contoured cement-retained restoration with lack of proximal spaces preventing access for cleaning. In this case, little benefit would have been gained from using a provisional restoration, and sadly remedial treatment is likely to involve removal of the original implants and reinsertion of implants into the correct position.

Figures 2 and 3: Optimal implant positioning in oro-facial, mesio-distal and apico-coronal dimensions will maximise the likelihood of achieving a predictable aesthetic outcome. Correctly positioned, prosthetically driven implant placement facilitates the fabrication of favourable contours for the definitive prosthesis. Coincidentally, loss of septal bone is now clearly visible and that accounts for the absence of proximal papillae seen in the pre-operative image in Figure 1.
As with most dental treatments, the use and application of provisional restorations is never totally transparent, and there are obviously occasions when they can prove to be invaluable. The current driving force with regards to implant dentistry in the aesthetic zone is primarily directed towards immediate implant placement following tooth extraction. If suitable primary stability has been achieved, it appears that immediate tooth replacement with a well-contoured provisional restoration gives the clinician the best chance of preserving the soft tissue architecture that surrounds the natural tooth. (11)

Provisional restorations are also an invaluable tool in the prosthodontic management of complex cases involving multiple units, and where planned changes to occlusal schemes and anterior guidance pathways are being proposed. Using provisional restorations, the clinician can incorporate a trial period during which the proposed changes can be tested to ensure that the patient will adapt well. In the most challenging of cases, involving the combined restoration of teeth and implants immediately adjacent to each other, provisional restorations allow for gingival tissue maturation around teeth following implant surgery and before the prosthetic.

Figures 7–8: Immediate implant placement following extraction of tooth 11 followed by immediate insertion of a screw retained provisional restoration.

Figure 9: Final insertion of the definitive screw-retained porcelain-fused-to-metal crown to replace tooth 11, showing excellent soft tissue architecture and maintenance of all the soft tissue contours.

Figures 10–12: Provisional screw-retained implant crowns were inserted on to implants to replace teeth 12 and 22. After a suitable period of use, open tray impression copings were customised with acrylic pattern resin in order to accurately replicate the emergence profile of the provisional restorations and support the soft tissues. Definitive restorations on the day of insertion demonstrate no significant soft tissue blanching or changes in the soft tissue contour, confirming accurate replication of the emergence profiles of the provisional restorations.
restoration margins for the definitive restorations are finalised. They also allow for more precise planning of gingival contours, especially as the emergence profiles of crowns on natural teeth and on dental implants differ so greatly. However, in every situation where a provisional restoration has been utilised, it is imperative that the clinician maximises the diagnostic yield that can be gained. This can be achieved by indexising the emergence profile and soft tissue profile created by the provisional restoration. A number of techniques have been illustrated in the literature, such as the use of customised impression copings and customised soft tissue profiling on the working cast.

Indeed, with the advent of more advanced techniques utilising computer aided design, it is now possible to optically impress the provisional restoration in situ and transpose this data on to a previously captured image of the fixture head, in order to more precisely copy the provisional restoration.

The decision as to whether or not we should be using provisional restorations in the aesthetic zone should therefore be guided by patient-centred decision-making and treatment planning, using the evidence available as a guide rather than to create rigid treatment protocols. Ultimately, our proposed outcomes should be patient-focused with the aim of meeting their, rather than our, expectations.

References


Figure 13: A well-contoured screw-retained definitive crown fabricated by a skilled technician is relatively straightforward to achieve when the implant has been inserted into the ideal position, and will result in a predictable final outcome.