

**Provisional Restoration for Implant in the Esthetic Zone: A Review**

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Abstract

Provisional restorations serve as a diagnostic tool to confirm esthetics, contours, accessibility for oral hygiene, and can be used to duplicate the definitive restoration. A provisional restoration allows for communication between the patient, dentist, and technician. The soft tissue around the implants can heal according to the contours of the provisional restoration. However, implant-retained treatment can require an extended period of osseointegration, and provisional treatment can be a challenge if a removable prosthesis is provided because adjustments of the denture may become necessary during healing. This article describes several different types of provisional restorations during the course of the implant treatment

Keywords- Provisional, Esthetic, Emergence Profile, Prostheses, Osseointegration.

Introduction

Dental implants are routinely utilized for support of fixed restoration in the replacement of missing and hopeless single and multiple teeth. Widespread acceptance of implant supported restorations is based on their excellent success rate and several principal advantages over the tooth - borne fixed and removable treatment alternatives.¹⁻

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Despite excellent success rates, implant treatment presents with some obvious challenges in the esthetic zone. The common sequelae of tooth loss, which include resorption of the alveolar bone and apical migration of gingival tissues, present a considerable challenge for the attainment of the ideal soft tissue aesthetic.^{9 10 11} With increased patient acceptance for implant treatment and demand for minimum disruption on the transition from natural dentition to implant supported restorations, a well-constructed provisional prosthesis that fulfills the functional, aesthetic and phonetics need is required prior to the delivery of the final restorations. An ideal provisional restoration should be strong, durable and aesthetic, and it ought not to produce excessive pressure to the underlying soft tissue, as undesirable transmucosal pressure can lead to interruption of healing at the grafted sites or implant osseointegration^{15 13 17}. 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.¹⁸

Provisionalization is an integral part of implant treatment in the esthetic zone, and several types of provisional restoration have been described.^{9 12 13} Selection of a specific type of provisional restoration is based on individual case requirements and chosen treatment plan. It is also obvious that some cases may require several different types of provisional restorations during the course of the treatment.¹⁴

Function of provisional restorations

According to the Glossary of Prosthodontic Terms, provisional prosthesis GPT 9: a fixed or removable dental prosthesis, or maxillofacial prosthesis designed to enhance esthetics, stabilization, and/or function for a limited period of time, after which it is to be replaced by a definitive dental or maxillofacial prosthesis; often such prostheses are used to assist in determination of the therapeutic effectiveness of a specific treatment plan or the form and function of the planned definitive prosthesis; syn, Interim Prosthesis provisional restoration: syn, Interim Prosthesis, Provisional Prosthesis a provisional prosthesis is a prosthesis designed to enhance aesthetics, provide stabilization and/or function for a limited period of time, and should be replaced by a definitive prosthesis after a period of time.

In restoration-driven implant placement, implants are positioned in relation to anticipated requisites of the restorative phase rather than the availability of bone. Provisional restorations can be used as a diagnostic restoration to evaluate the position and contours of the planned definitive restoration prior to surgical implant placement and during the healing

Table 1. Provisionalization prior to implant loading

Type of support	Prosthesis type
Removable	Partial acrylic dentures Essix appliance
Fixed tooth supported framework bridge	Archwire supported pontic Resin bonded pontic Resin bonded, cast metal
Fixed implant supported	Transitional implants

Types of provisional restorations

Provisional restorations in implant therapy can be in the form of removable or fixed prostheses. Removable provisional prostheses are generally tooth and/or soft tissue borne. Fixed provisional restorations can be supported by adjacent teeth or implant retained. They can be fabricated chair side, using similar techniques as in conventional prosthodontics; or in the laboratory on working casts; or as a combination of indirect-direct technique, where a provisional shell is fabricated before the patient's appointment, reducing chair side time. Provisional restorations may be constructed prior to tooth extraction, during socket healing, prior to implant placement, or during osseointegration period (Table 1). Provisional restoration could also be constructed after implant loading, allowing maturation of peri-implant soft tissue, and during construction of the final prostheses.

Provisionalization prior to implant loading

Removable prosthesis

An acrylic resin based removable partial prosthesis (Acrylic-RPP) is commonly prescribed as a provisional prosthesis for its fabrication simplicity, cost, and ease of insertion. The ability to modify an Acrylic-RPP to accommodate changes in ridge anatomy as a consequence of extraction, soft / hard tissue augmentation, and implant placement is also a welcome advantage. However, their bulkiness, palatal coverage and removable nature are often the cited reasons for dissatisfaction by patients. The possibilities of initiating soft tissue inflammation around gingival margins and the potential of exerting pressure to the underlying surgical site are also causes of concerns for the clinicians. It is crucial that the removable prostheses should remain passive during the initial healing phase following soft/ hard tissue augmentation procedures and following implant placement as mucosal pressure could risk flap dehiscence, membrane exposure and bacterial

contamination¹⁹ whereas micro-movement may lead to fibrous encapsulation of the dental implants²⁰. Often provisional dentures are adjusted to minimize contact with the healing implants²¹. There are alternatives to tissue borne provisional restorations. An Essix appliance may be used as a removable prosthesis in these cases, as well as in limited interocclusal space or deep anterior overbite. This prosthesis is made from an acrylic tooth bonded to a clear vacuum material on a cast of the diagnostic wax up. The prosthesis provides protection to the underlying soft tissue and implant during the healing phase. Limitations of this provisional restoration include its inability to mould the surrounding soft tissue, and lack of patient's compliance can cause rapid occlusal wear through the vacuum-form material. However, some patients may not like to wear, or are unable to tolerate, a removable provisional prosthesis, thus fixed provisional prosthesis are sometimes necessary.²¹



Modified removable partial provisional denture. The denture was modified during implant placement to allow proper healing of the underlying implants. The patient had low smile line.



An Essix appliance replacing upper central incisors. The teeth were spot cured to the clear vacuform template material.

Tooth supported provisional restorations

A fixed provisional restoration offers psychological benefit and convenience for the patients and protects the surgical site from transmucosal pressure. Where the edentulous span is small and the provisional phase is short, bonding artificial teeth or patient's extracted teeth to the adjacent natural teeth provide an easy and economical option. However, the bulk interproximal composite may result in unacceptable aesthetic outcome for some patients and the composite junctions are vulnerable to fracture. Mesh plates or fiber strips can be incorporated to reinforce the composite bridge and reduce the need for bulky interproximal composite^{22,23}

Fixed tooth supported provisional restorations in the upper anterior region include the use of orthodontic brackets and archwire on several teeth adjacent to the implant site with an attached pontic. An alternative method is the use of resin bonded provisional pontic, which are tooth supported and retained by acid etching the neighbouring teeth. Sometimes small retentive grooves within enamel on the adjacent teeth can be used to increase retention of the pontic. The pontic can be in the form of an acrylic tooth, porcelain, or decoronated extracted tooth. The resin bonded acrylic or natural tooth may be reinforced with composite resin and/or ultra high molecular weight

polyethylene ribbon (Ribbond Bondable Reinforcement, Ribbon; Ribbond Inc, Seattle, Wash., USA).^{13,16} These prostheses may continue to be reused as provisionals after an appropriate implant healing period. The archwire/resin retainer can be removed and reattached between the different surgical and prosthetic stages. They can also be used to guide the surgeon during grafting procedures and as a template for the final restoration.



Facial view of prepared teeth immediately after extraction. Strategic teeth were maintained to retain the provisional prosthesis. The implant sites were previously selected and the non-strategic teeth were removed according to the diagnostic wax up.



Fixed provisional restorations cemented on strategic natural abutments. The molars have been retained temporarily to maintain the vertical dimension of occlusion.

Transitional implant provisional restorations

In extended partial edentulous areas where there are no or limited natural abutments to support a provisional

restoration, one or more transitional implants may be used²⁴. These transitional implants are loaded immediately to support the provisional restoration. They can be used to support fixed restorations or to retain complete mandibular dentures.

Care should be taken in planning the position of these implants and with their maintenance post-loading. They should not interfere with potential implant sites, or be placed in poor quality bone. When the depth of available bone is less than 14mm or the amount of cortical bone is insufficient to provide stabilization, the immediate provisional implant may be contraindicated.²⁴

These implants are immediately loaded after a chairside reline of the interim removable partial dentures or polycarbonate crowns using auto polymerizing resin. Although these implants have been used with great success, excessive loading on TIs may result in their fracture. Moreover, placement of TIs too close to the definitive fixtures may prevent complete integration of the implant and the surrounding hard tissues²⁵.



Immediate provisional implants were placed and strategic teeth were maintained to support long-term telescopic provisional restoration.

Post-implant placement

Implant retained provisional restorations

Provisional restorations may be used at the time of implant placement or after an appropriate healing period. The term “immediate restoration” is used when a prosthesis is fixed to the implants within 48 hours without achieving full occlusal contact with the opposing dentition, whereas “immediate loading” is when the prosthesis is fixed to the implants in occlusion within 48 hours.²¹

There are several benefits to members of the treatment team and patient in using an immediate provisionalization technique. Immediate provisionalization offers the patient improved comfort and function during the implant healing period compared with a conventional denture. There are also fewer denture adjustments postoperatively with no need for tissue conditioning or relining²¹.

The decision to immediately restore or load dental implants is usually made during the treatment planning phase. The treatment can only be confirmed clinically at the time of implant placement with appropriate assessment of implant stability, bone quality, and general site health. In a recent consensus review,²⁶ four implants in an edentulous mandible, rigidly splinted with a fixed restoration on a framework (acrylic and/or metal) or hybrid prosthesis, can provide patients with a reasonable degree of confidence for evidence-based treatment. Primary stability of these implants is crucial in the decision for immediate provisionalization. The implants need to be well distributed across the mandibular arch to provide cross-arch stabilization. The final implant positions are based on the proposed restoration through the use of templates/surgical guide²¹.

In optimal situations where no further corrective procedures are indicated, provisional restorations can shape the emergence profile of the restorations, and the matured soft tissue contour can be transferred to the definitive restorations with customized impression

copings. Showed implant supported provisional restorations replacing both maxillary central incisors. The implants were placed in an ideal buccal-lingual position for screw-retained restorations. The provisional restorations were modified with the addition of acrylic resins at the fitting surfaces and interproximal areas between the central incisors during the provisional phase to shape the underlying mucosa and to encourage the filling of interproximal papilla. Demonstrated the mucosa contour shaped by the provisional restorations after 6 months of provisional phase.²⁸

It can be noted that the distal interdental papillae were supported by the interproximal bones of adjacent lateral incisors whereas the interdental papilla between the central incisors were formed by moving the contact points more apically showed the facial view of the definitive screw retained porcelain fused to metal crowns. Demonstrated another case where the implant supported provisional restorations were used to assess the level of the ideal contact points between the two implant-supported restorations. A better papilla fill was seen by shifting the contact points more apically.²⁸



Patient's existing complete mandibular denture was modified to accommodate temporary cylinders on the implants. A duplicate of the denture was used as radiographic and surgical guide for the

planning and surgical phase of the treatment. The three dimensional positions of the implants were determined from the diagnostic wax up and clinical and radiographic examination.



Self cure resin was used to attach the denture and the temporary cylinders. The denture flange was then trimmed and the fitting surface was adjusted to allow proper hygiene.

Cement retained provisionals

Clinicians have the option to either cement or screw retain their final implant restorations. There are advantages, disadvantages and limitations for each option and it is important to understand their influence on the final prosthesis. The decision whether to cement or screw retain a provisional or final implant restoration would be dependent on the clinical situations and clinicians' preference towards the method of fixation.²¹

Most implant companies have prefabricated abutments for cement retained restorations. These abutments come in various heights to allow enough space for the metal and porcelain in crown construction. They also have a slight taper and an indexing component providing resistance form for the overlying restorations. The abutments are torqued onto the implants, left in situ and a complementing pick-up coping component may be used for impression and transfer of the abutment position to the master cast. A plastic protection cap, usually cylindrical in shape, may be cemented on the prefabricated abutment until the delivery of the final prosthesis. This technique is

often used by clinicians in non-aesthetic regions of the mouth.



Cement on, prefabricated abutment was torqued to the recommended value, six weeks post-placement. The abutment was chosen to allow adequate space for crown construction within the available interocclusal space.

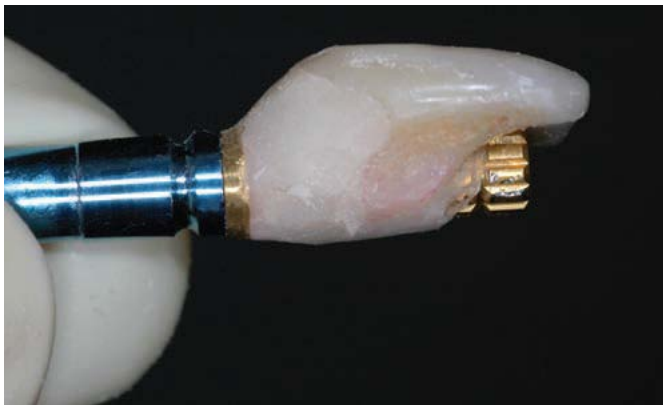


The denture tooth was relined intra-orally using self cured acrylic resin to capture the indexing component of the abutment. The relined denture tooth was fitted over the practice implant extra-orally. Note on the deficiency from the implant margin to the acrylic tooth due to tissue impingement. The deficiency was filled in and the excess material trimmed to the appropriate emergence profile. The provisional crown was cemented with provisional cement.

Screw retained provisional prostheses

Screw retained provisional restorations would eliminate the possibility of having any temporary cement present in

the peri-implant tissue. This can be achieved using temporary cylinders directly placed on the implant level. The provisional crown can then be built up in the laboratory on the master cast or chairside by using self or light cure resin or composite resin according to the diagnostic wax up. The temporary cylinder often has to be adjusted to fit into the occlusion.²¹



A screw retained provisional crown was made at chairside from the patient's existing partial denture, attached to the temporary cylinder using additional self cure resin. The excess temporary cylinder is reduced to follow the palatal contour of the existing partial denture and patient's occlusion.



Facial view of screw retained provisional restoration on tooth 11 site. The provisional restoration was hand tightened.

CAD/CAM Provisional Prostheses

With the advance in digital dentistry, CAD/CAM (computer aided design/computer aided manufacture) is

now gaining popularity for manufacturing prostheses. The construction of a CAD/CAM prosthesis starts with data acquisition involving the construction of a digital model using a dental scanner based on direct intra-oral scan or scanning an impression or a stone model of the patient. The prosthesis is designed virtually using a CAD program, which is then realized by processing with a milling machine, using the subtractive method or a 3-D printing machine, using the additive method²⁷. CAD/CAM technology can be used for the fabrication of provisional restorations employing high-density polymers based on a highly cross-linked polymethylmetacrylate (PMMA) or composite resin. They allow for an extended provisionalisation phase as the high-density polymers used offer favorable mechanical behaviors and biocompatibility compared to the traditional indirect provisional prostheses. Furthermore, the polymer-based materials enable reshaping, adding, and re-polishing procedures at chair side. Another major advantage provided by the CAD/CAM technology is the ability to design and modify the pontic morphology digitally to accommodate for the changes in soft tissue architecture throughout the treatment. In addition, with the use of the dataset stored, multiple millings without the need for a new intra-oral impression are achievable. This feature allows for easy replacement of a fractured prosthesis and trying of various aesthetic designs. The customized provisional prosthesis could subsequently be scanned and digitally transferred into the definitive prosthesis for a seamless delivery. CAD/CAM fabrication can be a cost-effective alternative to a laboratory-manufactured, long-term provisional prosthesis. Figures demonstrated the utilization of CAD/CAM technology for the construction of full arch zirconia, implant supported fixed maxillary and mandibular prostheses. Showed the intra-oral teeth set up try-in of the full arch implant supported prostheses. Once

the aesthetics, phonetics and occlusion were confirmed, the teeth set-up were placed onto the articulator and scanned for digital transfer. Prototypes of the final prostheses based on the teeth set-up were subsequently milled from polymer based materials for further intra-oral reconfirmation. Once all aspects of aesthetic, phonetic and occlusal needs were satisfied, the prototypes were scanned for the production of the definitive full arch zirconia prostheses. As all data were transferred digitally, errors sometimes encountered through multiple impressions and duplication processes were eliminated. The definitive prostheses were constructed to almost exact replica of the prototypes, and minimum adjustment was necessary on the day of delivery.²⁷

Conclusion

Treatment objectives of an provisional restoration include shaping/preservation of the gingival soft tissue contour, functional and esthetic substitution of the missing dentition during postsurgical healing, and definitive prosthesis fabrication stages. Provisional restoration can also serve as an esthetic and functional blueprint in the fabrication of the definitive restoration.

Various provisionalization options were discussed with some examples presented. Provisionalization of implants is often overlooked, as the time between impression and delivery of the final prosthesis can be short. Fixed provisionals would also help those patients that have not had removable prostheses before, providing a restoration which has superior comfort and aesthetics. Clinicians need to be aware of the range of techniques, materials and temporary implant components for short, medium and long-term provisionalization.

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