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Provisional Restorations In Implant Dentistry: Current Perspectives

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Abstract
With the improvement in implants, surgical armamentarium and implant placement procedures, implant dentistry has evolved into a modality with predictable outcomes. Esthetics has become increasingly important as one of the final outcomes which ultimately determines the success of the implant supported restoration especially in the maxillary anterior region. Provisional restorations can be a useful tool in the hands of the experienced dentist for improving the esthetic outcomes of implant restorations. In addition to their conventional role as an interim tooth replacement, they can also be used to condition the peri implant soft tissue contours and ultimately build an optimum emergence profile for the final restoration. Due care given at this step can ensure good esthetic results and a high patient acceptance level of the final restoration.

Key Words
Implants, Provisional restorations, Gingival conditioning, Transitional implants, Custom Impression coping

Introduction

Implant dentistry has been around for more than thirty years. From its humble beginnings in the early 80s, it has evolved into a highly specialized field with predictable treatment outcomes[1]. With improvements in the surgical procedures as well as implant surface and design, osseointegration and implant stability have become foregone conclusions to a certain extent. With increasing experience, there has also been an increase in expectations in treatment outcomes from both the clinician and the patient[2]. Two prime areas of concern include reduction in treatment time and greater emphasis on aesthetics as a criterion for implant success. With the success of the immediate loading and the immediate placement concepts, we have come into an era where people walk into the dentist's office with a missing or failing tooth and walk out with an implant supported restoration on the same day.

Provisionalisation has often been neglected in implantology. This is probably due to the past experience of dentists with provisionals in a conventional tooth supported fixed partial denture prosthesis. But a temporary prosthesis needs to remain in place for a very limited time in these cases. On the contrary, a provisional restoration over an implant might have to be retained for a few months and this could prove hazardous if adequate attention is not given to this step

Functions Of A Provisional Restoration

Provisional restorations have come to play an important role in implant dentistry. The time period for which they need to remain in place may vary depending on the implant site preparation required prior to implant placement, the loading protocol being followed and the soft tissue contouring required afterwards. Their primary function remains to provide the patient with an interim functional and aesthetic replacement for their natural teeth. They have also become an important tool for improving the aesthetic outcome for implant restorations. Today implant placement is carried out keeping in mind the position and requirements of the final restoration[3]. A properly fabricated provisional restoration can be used to determine various aspects including the tooth length, width, contours, embrasure form, midline positioning, incisal plane, gingival plane, symmetry, horizontal and vertical angulation, rotational alignment, vertical & horizontal overlap and anterior guidance[4]. These can further be utilized for designing a surgical template which ensures optimum implant placement.

The provisionals are also used to verify whether the implants have actually been placed in accordance with the planned positions of the surgical template. In case this is not so, then changes in the restorative plan will have to be made. They have also been used in impression procedures to accurately capture the soft tissue modality which ultimately helps ensure an optimum emergence profile for the final restoration[5]. The conditioning of the peri implant soft tissues can begin right after extraction of the tooth which is being planned to be replaced with an implant supported restoration. This can be done with the help of an ovate pontic attached to the adjacent teeth[6].

Types Of Provisional Restorations

The options available for temporarily restoring an edentulous space which is to be finally restored with an implant supported restoration can be classified as follows:

1. Fixed or removable
   a. Removable restorations
      i. Acrylic partial dentures
      ii. Vaccum formed appliances
   b. Fixed restorations
      i. Tooth supported
      ii. Implant supported
2. According to timing of fabrication:
   a. Prior to tooth extraction
   b. During socket healing
   c. Immediately prior to implant placement
   d. After implant placement
3. According to fabrication technique:
   a. Chairside
   b. Lab fabricated

Removable Provisional Restorations

1. Acrylic Dentures

These have been commonly used for both

partially and completely edentulous cases, though in the latter cases the patient's existing prosthesis is generally converted to an implant supported fixed interim prosthesis. The ease of fabrication & modification of these restorations are the prime reason for their popularity. They prove especially useful in cases requiring multiple hard & soft tissue altering procedures where they can be modified and reused[7]. They can also be used as a space maintainer in growing children where an implant supported prosthesis might have been planned sometime in the future. The aesthetics produced are generally good enough with proper shade selection of teeth. However, patient compliance can be poor due to the bulkiness of the prosthesis and the interference it can produce in speech & mastication. The bulkiness might be further increased by the presence of any wire components added to provide retention. Other limitations include the need for adequate interocclusal distance so that the denture base might have adequate thickness to prevent fracture. Also they are ineffective in space maintenance between the roots of the adjacent teeth. These prostheses need to be closely monitored to ensure that a passive fit is maintained and that the intaglio surface is maintained free of any areas which might result in soft tissue inflammation[8].

2. Vacuum Formed Appliances

These generally consist of an appliance fabricated from clear thermoplastic sheets which are moulded in vacuum using either the patient's pre-extraction models or after a diagnostic wax up on a post extraction model. The popular Essix appliance is a common example[9]. This appliance was initially introduced in the field of Orthodontics as a potential replacement for the Hawley's appliance[10]. The space which is created for the missing tooth can be occupied utilizing a denture tooth, light cure composite or a decoronated natural tooth. These appliances can prove superior to the acrylic dentures in terms of aesthetics . But the former share certain limitations with the latter like their dependence on patient compliance, lack of space maintenance in the radicular region and their inability to mould the surrounding soft tissue. In addition they are also prone to rapid wear & degradation in the oral cavity, especially in bruxers.

Fixed Provisional Restorations

1. Tooth Supported Fixed Restorations

Use of the adjacent teeth to retain a fixed provisional restoration has become quite popular in implantology. These can further be classified based on the type of pontic and the type of supporting framework utilized. The pontic that could be used in such restorations could include denture teeth, composite or ceramic pontics and the coronal portion of the natural teeth[11] with a variable amount of root portion remaining according to aesthetics and the magnitude of soft tissue moulding planned. Both denture teeth as well as natural tooth pontics can be directly bonded to the adjacent teeth thus eliminating any intervening lab steps. But they are generally preferred for a short duration only. Ceramic pontics, on the other hand are highly aesthetic and long lasting but require additional laboratory steps and expenditure.

The framework that can be used for these restorations could be made of cast metal alloys, fibre reinforced resin, autopoly merizing acrylic resin or even a wire of adequate thickness to maintain rigidity. In cases where orthodontic treatment precedes implant placement and the archwire is still in place, it can also be used to retain a restoration. The durability of the metal framework results in they being indicated in conditions where the provisional restoration needs to stay in the mouth for a long duration. But the use of a cast metal framework entails laboratory work and hence increases the final cost as well as duration of treatment. Aesthetics too may be compromised due to visibility of metal margins. This is not an issue with fibre reinforced composite framework, but they are less durable and might fracture during removal. In general both the cast metal and the fibre reinforced composite frameworks are not preferred in case multiple procedures are required prior to implant placement. This is because of the unpredictable retention and removal of the appliance and the difficulty in modifying the pontic (usually ceramic in these cases) for conditioning the healing ridge. To counter the problems that might be faced with a metal framework resin bonded prosthesis during repeated removal & insertion, a modified framework design has been described[12] wherein the pontic is split into a buccal and lingual portion which are retained by matrix and patrix components inserted adjacent to the edentulous space. In this way the implant site can be exposed by simply disassembling the pontic without the need to totally debond the whole prosthesis.

The use of 0.9 or 1 mm half round wire has also been mentioned in the literature. The wire can be adapted on a diagnostic cast and a pontic can either be attached or directly fabricated on the wire with composite resin. This can then be bonded to the adjacent teeth in the patient using flowable composite.

In patients who require multiple implant placement for rehabilitation, a staged approach might have to be followed sometimes due to different reasons. In such cases, some of the teeth which are ultimately planned for extraction might be retained to function as strategic abutments for a tooth supported provisional restoration over previously placed implants. They can be later extracted once the implant has osseointegrated and is able to support the provisional / definitive restoration on its own.

All tooth supported fixed restorations are "fixed" by the use of conventional luting agents or are resin bonded. In all these cases, it is important to ensure adequate clearance from opposing teeth. This might not be present naturally and could result in a significant amount of tooth reduction especially in case of deep anterior vertical overlap. In such cases a decision needs to be taken keeping in mind the benefit that such prosthesis will provide to the patient and whether a less invasive alternative (a removable appliance) could be used.

2. Implant Supported Fixed Restorations

Implant supported provisional restorations include restorations placed on transitional implants or those fabricated on the definitive implant (at the time of implant placement or after the elapse of a predetermined period of time for healing).

Transitional or provisional implants have been developed with the idea of supporting a provisional restoration (ranging from a single crown to a complete arch overdenture) till the definitive implants are deemed fit to be loaded. They are specifically indicated in conditions where immediate loading of the definitve implants is not indicated. These include implant placement in conjunction with ridge augmentation procedures, in medically compromised

patients, etc. They share similar characteristics with definitive implants like material, surface treatment and basic design, but are usually of a smaller diameter (less than 3mm). Various studies[13] have demonstrated the ability of the transitional implants to become osseointegrated though the bone to implant contact that has been reported is quite variable. For supporting a complete overdenture in an edentulous jaw, a minimum of four to six transitional implants have been recommended for both the mandible and the maxilla, though fewer implants have also been shown to be able to successfully support such restorations for short durations. It has been recommended that these implants should not be retained for more than a year as there would be a risk of bone fracture during implant removal after that. The basic disadvantages presented by this modality include the requirement for additional surgical procedures for implant placement as well as removal and adequate space to be present in the bone for harbouring both the transitional and the definitive implants at the same time.

Provisional restorations retained by the definitive implants can be either screw retained or cement retained. Further, they can be fabricated either before the implant placement, immediately after implant placement or after implant placement and a healing period.

The debate over preference for screw or cement retained prostheses is a long standing one and still remains inconclusive[14],[15]. Screw retained prostheses offers the advantages of easy retrievability which is very important in case of a provisional restoration. A cement retained restoration, on the other hand offers advantages of simplicity in fabrication and is especially indicated when implant angulation and positioning precludes the use of a screw retained one due to aesthetic reasons. In cases of multiple implants being used to support a single prosthesis, a screw retained prosthesis will require meticulous placement to ensure implant parallelism. The cement retained restorations are always subject to the dangers of excess cement contaminating the peri implant tissues, which has shown a positive correlation with increased risk of ultimate failure of the implant. This is especially likely to occur in instances where the margin of the restoration is kept subgingival.

Techniques for fabrication of the provisional before implant placement involve the use of a diagnostic wax up to fabricate a vacuum formed template[16]. A mock implant placement is simulated on the cast by drilling through the template and an implant analogue is placed in the site prepared. A temporary abutment can then be attached to the implant analogue, prepared and a provisional restoration can be fabricated over it using either a hollowed out denture tooth or a prefabricated polycarbonate crown. The provisional will require to be relined chairside using auto polymerizing resin or flowable composite once some amount of soft tissue healing has taken place around the implant. Occlusal contacts need to be adjusted according to the loading protocol being followed and may range from no contact to slight contact in centric relation contact position.

Provisional restorations can also be fabricated once the implant has been placed. This can again be started either at the time of implant placement itself (Stage I surgery) or immediately after implant uncovering (Stage II surgery) when either temporary or definite abutments are placed & modified. Furthermore, the technique for fabrication could be lab based or might be done chairside. Lab fabrication of a provisional reduces the actual chairside time required but adds to the cost factor. At Stage I surgery, to prevent contamination of the surgical site with impression material a technique has been described to transfer the position of the implant to a cast which has been fabricated pre-operatively[17]. It involves fabrication of a resin template on the cast encompassing teeth adjacent to the planned implant site. After implant placement, an impression transfer coping is placed over the implant. The template is seated over the adjacent teeth in the mouth, attached to the transfer coping with the help of autopolymerizing resin or flowable composite and removed together. An implant analogue is attached to the transfer coping. The cast is modified by drilling at the planned implant site so as to make space for the implant analogue and the template is reseated on the cast. The remaining space around the analogue can be filled up using a Type III or IV gypsum product and an optimum emergence profile can be created. A temporary abutment can now be placed over the implant analogue and a provisional restoration can be fabricated.

A simple alternative chairside procedure has also been mentioned in the literature where a provisional in the form of a denture tooth is selected based on the dimensions of the space available and is hollowed out to fit over an implant analogue[18]. It is then relined intraorally using flowable composite or autopolymerizing resin and is finished extraorally. Alternatively, a natural tooth can also be used in case of immediate implant placement[19].

Provisional Restoration As A Custom Impression Coping

A simple impression using standard impression copings helps record & transfer the position & orientation of the implant but gives no information regarding the soft tissue contours in the peri implant region or of the emergence profile of the planned restoration. This can be accomplished using impression copings whose margins have been customized either intraorally using autopolymerizing resin or extraorally using the provisional restoration. For the extraoral technique, the provisional along with the abutment is attached to an implant analogue and a mould is created. Once the mould is set, the restoration & abutment are removed and an impression coping is attached to the analogue. The space around the impression coping formed by the provisional restoration is filled with acrylic resin and it can then be used in impression making. A soft tissue cast is poured around the customised impression coping producing a cast with the implant position and soft tissue representing the intra oral conditions. An alternative technique involves placing the provisional restoration on the master cast that is made routinely and the existing soft tissue cast can be removed. The provisional restorations are removed from the patient and placed onto the master cast and impression material is extruded around the provisional restoration to form the soft tissue contours presenting intra orally. The provisional restoration can also be incorporated into the impression. When screw retained restorations are used, the provisional restoration itself can be used as a pick up type impression coping[20],[21]. A soft tissue cast is poured around the exposed provisional after an impression coping is attached, yielding a soft tissue cast which is identical to the soft tissue form intra orally.

Conclusion

Provisional restorations play a multi-faceted role in implant success. They have also proved to be a significant factor in implant failure when used improperly. Clinicians need to be aware of the range of techniques, materials and temporary implant components for short, medium and long-term provisionalization. The need for provisionalization should be considered during the treatment planning stage, and reassessed continually throughout the implant therapy.

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