



Transitioning Patients From Teeth to Implants Utilizing Fixed Restorations

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ABSTRACT The provisional phase of treatment can be the most challenging in implant dentistry. The choice of provisional restoration should be based on esthetic demands, functional requirements, duration, and ease of fabrication. One major obstacle to treatment with implants is the transitional phase between a tooth-supported occlusion and an implant-supported occlusion. This is of particular concern when a patient with a failing dentition has not worn a removable prosthesis before and is planned to have a reconstruction supported by implants.

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Implants were originally designed with the edentulous patients in mind, as well as to compensate for the poor support and retention available from the mucosa.^{1,2}

With conventional delayed loading protocols, patients receiving implants are sometimes required to wear a removable transitional prosthesis. For many patients this is unacceptable both socially and esthetically.

Achieving osseointegration is not the challenge that it seemed to be 30 years ago. Today, implant integration is a given and providing an implant-supported restoration that is in harmony with the surrounding hard and soft tissues is the goal. Bone and gingival grafting procedures are routinely used to optimize the site prior to implant placement. Removable prostheses can hamper these procedures as

pressure from removable prostheses can interfere with the proper healing of grafts.

The purpose of this article is to describe options other than removable prostheses in transitioning the patient from teeth to implant-supported restorations. Emphasis is placed on fixed transitional prostheses for the reasons described above.

Transitioning Patients From Teeth to Implants

Today's patients have high expectations regarding esthetics and providing functional restorations alone may not be sufficient to satisfy many of them. With heightened esthetic expectations, it becomes imperative the restorative dentist understand the patient's desires and expectations prior to embarking upon any irreversible therapy. Moreover,

emphasis should be placed on diagnosis and treatment planning because in most situations the proper diagnosis will dictate the appropriate treatment plan. Inadequately planned treatment and inadequately informed patients, even when well executed, will result in less-than-ideal treatment satisfaction.³

The functional and esthetic replacement of missing teeth with dental implants remains a complex task under most conditions. With comprehensive treatment planning and proper surgical and restorative protocols more predictable results can be achieved. With this in mind, transitioning the patient from teeth to an implant-supported restoration becomes even more difficult as precise planning will now include timing of extractions, method of retaining fixed provisional restorations, manipulation of remaining teeth to enhance implant receptor sites, and many other considerations. Patients almost always prefer to have a fixed prosthesis during this transition.

The rationale for fixed transitional prostheses suits both the patient and the clinician. Patient management with a fixed prostheses has the advantages of elimination of the discomfort experienced with a removable prostheses due to impingement of the mucosa, the psychological advantage of having a fixed restoration during integration of the implants, preventing transmucosal loading of the implants, and not interfering with any grafting procedures. The clinician also benefits by decreased chairtime, unscheduled visits, and reduced maintenance of the provisional prosthesis.

One disadvantage of using a fixed prosthesis in transition is the additional cost involved. However, in patients embarking upon already costly and lengthy therapy, the additional cost for comfort and convenience



FIGURE 1. An implant-supported prosthesis is planned for teeth Nos. 25 and 26. The adjacent teeth have porcelain veneers. The patient wanted to avoid a removable prosthesis in the transitional phase.



FIGURE 2. A resin-bonded fixed partial denture is a convenient way of transitioning the patient. It is entirely tooth-supported and avoids putting pressure on the implant site.



FIGURE 3. Facial view showing interim partial denture replacing teeth Nos. 7 and 9. The patient requested implant-supported restorations and was dissatisfied with the proportions of the teeth.



FIGURE 4. Facial view showing discrepancy in tooth length.



FIGURE 5. Diagnostic wax patterns from teeth Nos. 7-10 illustrating anticipated contours of final restorations.



FIGURE 6. Provisional restoration following removal of crowns on teeth Nos. 8 and 10. This provisional restoration can also function as a radiographic guide.

outweighs the social embarrassment of wearing a removable prosthesis.

There are several methods to transition a patient from teeth to implant-supported restorations, each having its own indication. The following methods will be discussed.

Options

- Resin-bonded fixed partial dentures
- Use of provisional fixed partial dentures
- Use of strategic abutments and

full-arch provisional fixed partial dentures

- Provisional implants
- Immediate loading

1. RESIN-BONDED FIXED PARTIAL DENTURES

Since the pioneering work of Rochette, there have been a plethora of techniques developed to enhance the success of resin-bonded fixed partial dentures.^{5,6} The literature indicates resin-bonded fixed partial dentures can have sustained clinical success over time and there are indications for their use as definitive restorations.⁷



FIGURE 7. Autogenous bone grafts placed in sites Nos. 7 and 9.



FIGURE 8. Provisional restoration placed back in situ. It is adjusted so all pressure is kept off the graft site.



FIGURE 9. Provisional restoration following placement of dental implants.



FIGURE 10. Definitive implant restorations on teeth Nos. 7 and 9 and metal ceramic restorations on teeth Nos. 8 and 10.

When treatment planning implant-supported restorations, these prostheses are a useful tool. They can be bonded to a single abutment tooth (**FIGURES 1 AND 2**). Advantages being that the implants are not loaded, the patient has the convenience of a fixed prosthesis, and no tooth structure is removed from the abutment tooth.

2. USE OF PROVISIONAL-FIXED PARTIAL DENTURES

In situations where the adjacent teeth have full-coverage restorations that require replacement, provisional fixed partial dentures provide a convenient and predictable option without compromising the implant site. Periodontally compromised teeth can also be retained to support a provisional prosthesis during the healing phase, these teeth eventually being extracted and the restoration becoming fully implant-supported. One advantage of a fixed provisional is that no pressure is exerted on the implant or grafted site. These types of provisionals are generally easy to remove and make alterations. Disadvantages of these types of provisionals include fracture, loosening, and the possibility of recurrent caries.

In the esthetic zone a fixed transitional prosthesis also provides benefits. The patient in **FIGURES 3 AND 4** presented requesting replacement of her removable partial denture replacing teeth Nos. 7 and 9 with implant restorations. On clinical and radiographic examination, there was inadequate buccolingual width for placement of implants in ideal positions. Diagnostic wax pat-

terns were completed (**FIGURE 5**) and a provisional fixed partial denture fabricated for teeth Nos. 7-10 (**FIGURE 6**).

Autogenous bone grafts were completed to augment bone width (**FIGURES 7-9**). The provisional restoration served to maintain esthetics and relieve the surgical site from any untoward pressure in the healing phase. The definitive implant restorations are illustrated in **FIGURE 10**.

3. USE OF STRATEGIC ABUTMENTS

Complex reconstructions that require implants for support take time to complete; this length of treatment is exacerbated when bone grafts are required. Maintaining some natural tooth abutments for this period of time to retain a fixed provisional restoration is one of the best methods to maintain function and esthetics whilst the graft and implant sites are healing. The advantages of a fixed prosthesis are similar to those described earlier for the adhesive type fixed partial denture. Abutments with a poor prognosis are often utilized as these abutments eventually will be extracted when the implants have integrated; these abutment teeth only need to survive until implants integrate.

Strategic abutments are commonly used in complete arch situations when the patient's existing dentition is failing due to periodontal disease. Implant sites are selected first, those teeth occupying the implant sites are removed, and the remaining teeth are used to support a provisional restoration. The alternative to this would be to edentulate the patient

and place an immediate denture. The psychological and physiological changes associated with a complete denture can be dramatic. If onlay grafting is required for these types of patients, the pressure exerted by the removable prosthesis can accelerate resorption of the graft and negate the surgeon's initial efforts. Maintaining a few teeth to retain a fixed transitional prosthesis provides both physiological and psychological advantages for the patient, one of the most important being the psychological security of a fixed prosthesis in social settings (**FIGURES 11-24**).

When integration of the implants is confirmed, the strategic abutments are extracted and the reconstruction with implants as the source of support can continue. Advantages of this approach include maintaining the patient in a fixed prosthesis and protecting surgical and implant sites during the healing phase. Disadvantages include increased cost for the patient and the possible adverse sequelae to implant integration should retained abutments become infected during the integration.

The patient in **FIGURE 11** had a peri-



FIGURE 11. Facial view illustrating periodontally failing dentition. The patient has been treatment planned for complete-arch extractions and fabrication of implant-supported prostheses. The patient wants to avoid a removable prosthesis during the transitional phase.



FIGURE 12. Maxillary occlusal view illustrating classic splinted perio-pros type of prosthesis with precision attachments.



FIGURE 13. Mandibular occlusal view illustrating classic splinted perio-pros type of prosthesis with precision attachments.



FIGURE 14. Panoramic radiograph illustrating bone loss around abutment teeth.



FIGURE 15. Maxillary provisional shell prosthesis prepared in advance to be relined on the day of extraction.



FIGURE 16. Mandibular provisional shell prosthesis to be relined on the day of extraction.



FIGURE 17. Maxillary fixed partial denture removed to evaluate quality of abutment teeth.



FIGURE 18. Strategic abutment teeth maintained to support a provisional fixed partial denture.



FIGURE 19. Mandibular fixed partial denture removed to evaluate quality of abutment teeth.

odontally failing dentition and was treatment planned for removal of all teeth and an implant-supported reconstruction. The thought of a complete denture was unbearable and the opportunity to transition to the implant-supported option without the use of a complete denture significantly softened the blow and enhanced her acceptance of the treatment (FIGURES 12-24). The extractions were done in two phases, the maxillary prosthesis was dismantled and the teeth were prepared to receive a fixed transitional

prosthesis in each arch. This prosthesis was placed on the day of extraction. The mandibular prosthesis was then addressed in a similar manner. A bilateral balanced occlusion was provided.⁸ This allowed the patient to function with a fixed prosthesis during the healing phase and allowed the clinician to protect the implant surgical site during the submerged healing phase.

4. TRANSITIONAL IMPLANTS

Immediate loading concepts have been well established. These tech-

niques have been well-documented for implant retained mandibular overdentures and for mandibular implant-supported complete dentures.⁹⁻¹⁴

Prior to the advent of immediate loading concepts, transitional implants were developed to enable undisturbed healing and the patient demand for uninterrupted immediate function and esthetics. The primary function of transitional implants is to absorb masticatory stress during the healing phase, ensuring stress-free maturation of the



FIGURE 20. Strategic abutment teeth maintained to support a provisional fixed partial denture.



FIGURE 21. Smile view of full-arch provisional prostheses in situ.



FIGURE 22. Facial view of full-arch provisional prostheses in situ.



FIGURE 23. Right lateral view of provisional prostheses.



FIGURE 24. Left lateral view of provisional prostheses.

bone around the submerged implants, allowing them to heal uneventfully.^{15,16} Most importantly, patients immediately experience the benefits of implant dentistry and emerge from of the surgical phase with a fixed prosthesis.

The scope of transitional implants can be expanded into diverse applications, such as undisturbed healing of bone grafts and provisionalization of fully and partially edentulous patients. They are particularly useful in situations when bone quality is not adequate for immediate loading of the definitive implants but the patient requests a fixed transitional prosthesis. For a complete arch prosthesis, a sufficient number of transitional implants should be placed to allow survival of the prosthesis should one or two implants fail.

Transitional implants are an effective way to generate esthetic transitional prosthesis. For the clinician they allow evaluation of esthetic, phonetics, and function in the interim phase. Patients can return to their daily activities with a fixed restoration and avoid social embarrassment.

With all the advantages of transitional implants they still should be used with

caution. On occasion, the volume of bone used for their placement may be of strategic value during treatment and risks being destroyed by fibrous tissue formation or bone resorption when loaded immediately. Also, if a definitive implant fails, the alternate site has already been used and is unavailable.

5. IMMEDIATE LOADING

The predictability of dental implants using the traditional Branemark protocol has been well-documented. Since its inception, this protocol has been progressively challenged to decrease treatment time, minimize the number of surgical procedures, and maximize esthetic outcomes.

Practitioners should be aware that the Branemark protocol was empirical and based on clinical observation, it was a protocol that ensured integration of implants, but each and every step may not be necessary.¹⁸ Treatment of completely edentulous patients with dental implants highlighted many complications during the osseointegration phase. Complications involving complete dentures worn during the

period of osseointegration included loose dentures, fractured prostheses, sore spots, and periodic provisional relines. Today, in specific clinical situations, implants may be placed and immediately loaded with provisional restorations. Immediate loading in the edentulous mandible has been well-documented.¹²⁻¹⁴ There are also patient treatment reports to show that immediate loading of the edentulous maxilla is feasible if bone quality is suitable.^{19,20}

Immediate loading is a very effective way of transitioning patients from teeth to a complete full arch implant-supported restoration. Based on guidelines from previous studies primary stability appears to be the most important parameter for immediate loading.¹²⁻¹⁴ Stability is dependent on proper surgical technique and type of bone.

The following recommendations should be considered to maximize success:²¹

1. The bone quality and quantity should be adequate. A minimum bone height of 10 mm is desirable and adequate bone quality (type I or II) are ideally required.
2. Implants should be at least 10 mm long.
3. There should be an adequate number and distribution of implants to provide cross arch stabilization.
4. Good initial stability of the implant with minimum insertion torques of 35-50 Ncm²²
5. Passive fit of the provisional restoration
6. Sufficient interocclusal space should be present to allow fabrication of a



FIGURE 25. Preoperative situation illustrating overerupted mandibular anterior teeth.

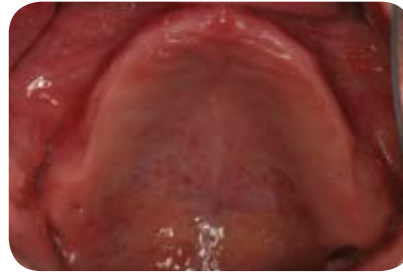


FIGURE 26. Occlusal view of palate showing trauma to palate from existing denture.



FIGURE 27. Occlusal view illustrating mandibular tori.



FIGURE 28. Surgical guide.



FIGURE 29. Implant placement using surgical guide. Sufficient space must exist between the incisal edge and the head of the implant to allow for bulk of restorative material.



FIGURE 30. Implants placed note favorable anteroposterior spread.

provisional restoration with adequate rigidity.

7. Even occlusal contacts

8. Cantilevers should be avoided or minimized to one premolar (**FIGURES 32 AND 33**).

9. Removal of the provisional restoration should be avoided during the osseointegration period.²⁴

10. Patients with parafunctional habits may not be ideal candidates.

Advantages of immediate loading are obvious for the practitioner. The practitioner benefits from a reduced number of postoperative visits and reduced maintenance of the provisional restoration⁴ (**FIGURES 25-35**).

Risks of immediate loading are perceived to be higher during the first week following the insertion of implants. The bone interface is actually stronger on the day of implant placement compared with the time three months later, although this is location-dependent.²³ The risk of immediate loading is implant failure and implant failure can cause the use of a removable prosthesis if the remaining

distribution of implants will not allow proper stabilization of the provisional restoration, an unstable restoration would jeopardize the remaining implants. Failure also brings with it additional appointments and greater chairtime for the clinician, which translates to increased costs. Patients must be made aware of the risks of failure prior to embarking upon this path; immediate loading is a risk both patient and clinician must share.

One benefit of immediate loading is function, and, of late, the benefit to esthetics has come to the forefront. Clinicians have recognized that preserving the hard and soft tissue components that exist around natural teeth while transitioning to implants is easier and more predictable than losing these elements following tooth extraction then trying to rebuild them. Techniques that involve immediate extraction, immediate placement, and immediate loading have also been advocated.

The advantages of immediate restoration are obvious; however, the application of immediate or early load may pose an increased risk of implant failure

in single-tooth situations. The parameters for achieving and maintaining equal success rates of osseointegration for single teeth are not fully known.

Sufficient data are available to support the concept that immediately restored and loaded implants in single-tooth situations in the esthetic zone can achieve integration using many implant systems and protocols.²⁴⁻²⁶ Many authors have concluded that esthetic results in immediately loaded sites are superior to that achieved with a staged approach because of gingival architecture preservation.

Most studies and patient treatment reports are carried out by highly trained clinicians working under strict protocols. These protocols respect certain parameters. Factors that have been highlighted to improve the success rate include absence of parafunctional habits, use of a roughened implant surface, use of a threaded implant, and, most importantly, primary stability. Removing occlusal contacts and enforcing a soft diet have also been proposed.

The risk of immediate load in a single-



FIGURE 31. Provisional cylinders have been attached to transmucosal abutments.



FIGURE 32. Provisional cylinders have been attached to relieved denture intraorally (using GC resin, GC America).



FIGURE 33. The remaining space between the provisional cylinders and the denture is filled with pink acrylic resin.



FIGURE 34. Cantilevers are removed from the prosthesis and the prosthesis is polished.



FIGURE 35. Smile view of screw retained immediate load prosthesis. Prosthesis has been adjusted to allow the patient to maintain hygiene.

tooth situation should be obvious to the clinician. The risk of failure is a costly one that has both biological and financial repercussions. Many studies and reports do not address the consequences of failure and how the patient is managed.

It is prudent to ask:

- Is immediate loading in the esthetic zone really worth the risk?
- Does delaying placement of the restoration disadvantage the patient?

Immediate loading in the esthetic zone is becoming ever more accepted. The clinician has a chance of success with adequate treatment planning, incorporating as much clinical data as possible and understanding the limitations imposed. Patient selection and risk/benefit analysis for each patient will lead to more predictable and desirable outcomes.

Summary

An axiom of traditional prosthodontics is to provide a fixed prosthesis whenever possible. When patients are going through lengthy and costly implant therapy their expectations for both func-

tion and esthetics are high. This expectation stands for both the provisional and definitive restoration. Patients prefer to avoid wearing removable restorations in the transitional phase. The advantages of this have been previously outlined. There are many options to transition a patient from tooth-supported to implant-supported restorations utilizing a fixed transitional prosthesis.

The increased costs are offset by the practical and psychological convenience of a fixed prosthesis. Patients realize the benefits of implant therapy immediately and are more likely to be accepting of treatment plans involving extensive implant restorations. ■■■■

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