

# Literature Review: Implant Provisionalization in the Esthetic Zone

## INTRODUCTION

**Background:** With implants and implant restorations quickly becoming the "standard of care" for single tooth edentulous areas, many general dentists are receiving an influx of such cases, and in many cases, these dentists must be tasked with provisionalizing. This is most certainly true for implant placement in the esthetic zone, where a patient is far less likely to opt to leave the space open for the 3-6 months required for osseointegration. In addition, the provisional can be a key asset to the esthetic dentist, aiding in soft tissue contouring and offering an opportunity to guide and improve upon the final restoration.

There are several types of provisionals most often used by the restorative dentist, with the most common being a removable interim partial prosthesis ("flipper"), clear vacuform and resin composite trays ("Essix retainers"), and lab or CAD/CAM fabricated fixed prostheses. The choice of one of these such provisionals often falls to comfortability and familiarity of the operator, costs, and esthetic demands of the patient. However, there are a variety of factors that should be considered, and will be explored in this informational literature review. Now more than ever, dentists must begin to add more nuance and background knowledge to their choice in provisional, as no two cases are the same, and as we are being faced with more cases and more esthetically savvy patients than ever. The service we can provide to these patients continues to improve as the technology and literature advances, and as more and more clinicians begin to invest in computer aided design and manufacturing entities.

This review will seek to compare and contrast the most widely used methodologies of implant provisionalization, and in doing so will offer a brief guide to restorative dentists curious to consider alternate prostheses to better fit the needs of their esthetically driven patients.

Using a PubMed database search, studies were identified which contained the key MeSH terms "dental implant," and "provisional." This was used to identify a larger scope of literature which discussed dental implant provisionalization in the context of alternate methods in relation to the gamut of provisionals widely practiced as of July 2021. From there, the 2 main avenues of dental implant provisionals were identified, which were removable and fixed prostheses. In these categories, the most widely known of each included interim partial prostheses ("flippers"), clear vacuform and resin composite trays ("Essix retainers"), and the broad avenue of lab or CAD/CAM fabricated fixed prostheses. Once these categories were identified, the literature was individually reviewed to identify the advantages, disadvantages and in some cases recent advancements of each.

This review focused largely on maxillary anterior implant restorations, as these are most likely to require provisionalization and often take soft and hard tissue management into account in the choice of provisionalization and treatment planning of the final restoration.

## Removable Prostheses

**Interim removable partial prostheses**, or "flippers" as they are commonly known as by patients are an acrylic based appliance which is commonly used to temporarily replace 1-3 teeth, usually in the anterior, while a final restoration is being fabricated (fig 1). **Advantages** to such an appliance include their cost effectiveness (they are often at least partially covered by some insurances, and lab fees average below \$500), time effectiveness for the operator (limited chairside fabrication/adjustment), and their familiarity to both the dentist and the general public.

However, clinicians should be weary when adopting this method of provisionalization, as flipper use has been associated with disruption of bone and soft tissue grafting. Pressure on the healing graft and/or implant site can cause morphological changes and even failure. Dentists who use this provisional method must be sure to fully relieve any soft tissue contact, and caution patients against functioning with the flipper in place. Additionally, it has been said that the flipper is a poor method of communicating final restoration esthetics, both with the patient and the lab.

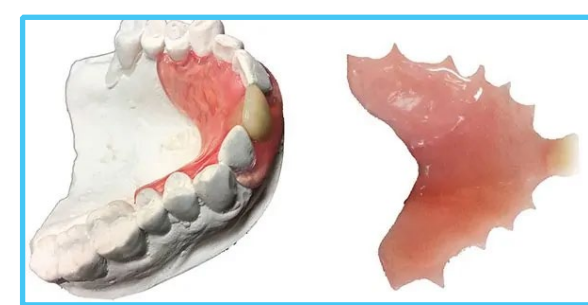


Fig 1. Dental Flipper

**Vacuum-formed retainers** aka Essix retainers (fig 2) are perhaps the most cost effective and quickest provisionalization technique. A stone model of the patient's dentition is used to form a clear plastic tray, which is then filled with composite resin at the edentulous site. The clinician can fabricate the retainer in-office, saving lab fees and waiting time for the patient. Essix retainers also have the major benefit of avoiding impingement on the implant or soft tissue. They can easily and safely be used on a patient who requires adjunct grafting procedures. However, an Essix retainer is often considered the least esthetic option, and many patients find it uncomfortable to have their bite altered by the layer of plastic and cumbersome to remove to eat and sleep.



Fig 2. Essix Retainer

## Transitional Fixed Provisionals

### Tooth supported fixed provisionals:

Tooth supported fixed provisionals encompass a wide variety of prostheses that are very commonly used by clinicians. There are multiple ways to fabricate such a prosthesis, and many have similar success in the literature. These provisionals are typically not in occlusion, as they remain dependant on adjacent teeth and bonding techniques for their stability.

**Case Study (fig 3):** An extracted tooth has been retained and used as a pontic for a chairside fiber-ribbon reinforced temporary Maryland bridge. The use of this method with a specialized healing abutment to concurrently create a soft tissue emergence profile is a good option not only for clinicians concerned about the cost of multiple lab made transitional provisionals, but is also a very effective method of communicating a natural-appearing esthetic outcome for the final restoration to the dental lab.



Fig 3. Images courtesy of Chris Salerno DDS. Included with permission.

### Implant supported fixed provisionals:

Implant supported fixed provisionals follow similar fabrication protocols to tooth supported restorations, in that they may be lab made, digitally designed and milled, or made in office using pre-formed or wax-up guided restorative materials.

Advantages of implant supported fixed provisionals include:

- Provides communication to the lab and to the patient regarding final esthetic outcome
- Opportunity to guide soft tissue emergence profile/sculpting
- Research has shown that implants provisionalized immediately and placed into partial or reduced occlusion have similar success rates and similar mean marginal bone levels as conventionally loaded implants (Slagter et al.)

## Immediate Functional Loading

**Background:** Immediate functional loading has been described as the placement of a final restoration that is fully in centric occlusion with the opposing dentition within 48 hours of implant placement (Santosa 2007). It is widely regarded among the dental community that the immediate loading of a newly placed implant is commonly linked to implant failure due to occlusal and functional forces impacting osseointegration. However, due to a recent availability of literature regarding the success in immediately loaded implants, more and more clinicians are considering adopting this methodology in select clinical scenarios.

**Advantages** described for the immediate functional loading of implants obviously include minimizing the amount of procedures the patient must undergo and time to final restoration. However, more recently this technique has seen high levels of success partly due to innovations in implant design.

Implant Design factors that influence success by increasing primary stability:

- **Platform switching:** An 2016 study found that an internal hex design increased micro stability and mitigated marginal bone loss in immediate loaded implants. The "one abutment, one time" method in which a final abutment is placed has been thought to preserve peri-implant bone more successfully than multiple abutments, but research is ongoing (Grandiet al., 2016).
- **Implant surface modification:** Most titanium implants exhibit a roughened multi-threaded surface, which acts as scaffolding for osseointegration. More recently, implant manufacturers have attempted to create osseointegrative implants by hydrothermally treating the implant surface with hydroxyapatite. When immediately loaded, these implants have been found to yield similarly predictable clinical results 2 years post-operatively to conventionally loaded implants (Simmons et al., 2015).

Many clinicians remain remiss to immediately load implants, as many feel the literature and implant technology has yet to yield clinically predictable results. Many studies reviewed suggested a similar conclusion- immediate loading of single tooth implants seen to be as safe and reliable as conventional techniques, however there exists a need for long term clinical follow up studies. In the meantime, many dentists prefer not to take the risk, and continue to rely on the current research supported methods.

## Soft Tissue Management

### Background:

Peri-implant soft tissue defect and deficiencies are relatively common in the esthetic zone, where biotype thickness is a major concern. Additionally, many clinicians are well aware that even a small amount of recession or reduction in thickness can lead to the dreaded gray discoloration characteristic of implant/abutment surface show-through. Thus, many restorative dentists and periodontists concern themselves with sculpting of the peri implant soft tissue, which not only leads to a more esthetic outcome, but has been shown to preserve implant health and marginal bone levels (Zucchelli et al.)

There are many ways to yield an esthetic and functional soft tissue profile, many of which include connective tissue grafting. We will focus on clinical scenarios in which the biotype and level of keratinized tissue is sufficient to forgo grafting and focus on pure sculpting of tissue using custom abutments.

### Custom Healing Abutments for Soft Tissue Sculpting:

When immediate loading is not possible to guide the soft tissue profile, clinicians may consider custom healing abutments.

### Advantages:

- Preserves natural soft tissue contours for a more esthetic and true to form final outcome
- Eliminates need for uncovering surgeries (fewer office visits for patient)
- Recent studies have detailed a chairside approach to making custom abutments using polyester-ether-ketone (PEEK), eliminating the need for lab made designs



## Technology: CAD/CAM and 3D printed Restorations and Custom Abutments

The overhead cost of implants, abutments and implant restorations can be a taxing component of the implant process. In addition, many clinicians find the variety of implant-abutment interfaces and systems available on the market to be daunting, with valuable time spent determining implant type and restorative technique, which may often differ between each system. Thus, many implant focused dentists may choose to invest in CAD/CAM and/or 3D printing technology to produce clinically predictable implant restorations, and abutments within their own office.

### CAD/CAM Manufactured Technology:

In a recent study, chairside fabricated custom zirconia implant abutments were shown to have a higher fatigue fracture resistance than conventional titanium abutments (Giner et al., 2021). In addition to the strength characteristics of milled zirconia, the fabrication of zirconia abutments allows for increased esthetic outcome in the anterior zone, where gray metal show through and over-opacity is a major concern. The ability to custom shade the abutment may allow for better shade outcomes in the final restoration, meaning the abutment can be treated as a "stump shade," such as with a conventional tooth supported restoration.

### 3D Printing:

3D printing in the dental implant world remains extremely new and uncertain, and has not yet crossed the boundary into the everyday office. However, manufacturers are beginning to develop novel dental implants more closely resembling a tooth using 3D printing technology, which offers more geometric freedom than conventional milling techniques. Research is ongoing on the advantage of such implant types over commercially available screw-type implants.

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