



Using Provisional Restorations to Guide Tissue Healing for Predictable Prosthetic Esthetics

By Bruce Kleeberger, DDS

ABSTRACT

Provisional restorations can be used to guide soft tissue healing following surgical intervention. Interdisciplinary treatment planning for predictable outcomes is critical and involves coordinating the various specialist services. Five cases are presented to demonstrate the use of bis-acryl ("composite") materials at various stages of the restorative process. Some of these involve fixed tooth supported restorations and others are supported by osseointegrated implants.

The development of multi-opacity, repairable and polishable bis-acryl materials has improved our ability to durable long term provisionals. They can be manipulated easily chairside to provide a matrix which supports the tissue or generates a force to direct gingival tissue healing. In addition, these provisional restorations are highly esthetic.

RÉSUMÉ

Les restaurations provisoires peuvent être utilisées pour guider la guérison des tissus mous après une intervention chirurgicale. La planification des traitements interdisciplinaires pour prévoir les résultats est essentielle et implique la coordination des services de plusieurs spécialistes. Cinq cas sont présentés pour montrer l'utilisation des matériaux bis-acrylique ("Le composite") à des stades variés du processus de restauration. Certains comprennent des restaurations de dents fixes et autres sont soutenues par des implants osseointégrés.

About the Author

Dr. Bruce Kleeberger graduated from the University of Alberta, Faculty of Dentistry in 1978 and has been in full time practice for 30 years. He is a charter member of the Canadian Academy of Computerized Dentistry and of the Canadian Academy for Esthetic Dentistry. He holds a certificate of proficiency in the diode laser from the American Academy of Laser Dentistry.

Dr. Kleeberger has lectured on dental materials selection, dental techniques and treatment planning and conducted hands on training for graduate dentists. He has published in national and international peer reviewed professional publications. He reviews for the Academy of General Dentistry publication General Dentistry and the Journal of the Canadian Dental Association.

Correspondence may be directed to Dr. Bruce Kleeberger, BSc, DDS at drkleeberger@telus.net.



Le développement de matériaux bis-acryliques multi-opaques, réparables et polissables a amélioré la durabilité des provisoires de longue durée. Elles peuvent être manipulées facilement sur place pour fournir une matrice qui soutient le tissu ou produit une force pour diriger la guérison du tissu gingival. En plus, ces restaurations provisoires sont hautement esthétiques.

Dental patients have heightened awareness of the esthetic potential of their dental treatment. They demand beautiful and durable restorations. The restoring dentist is obligated to provide a high level of interdisciplinary care and must be able to coordinate the various specialties of dentistry to meet these requirements. It is imperative that each case be planned carefully; beginning with the end in mind and with the patients' expressed wants as a consideration during the planning phase but also through the entire course of treatment. The restoring dentist must be the "quarterback" for the entire game plan in order that the patient (the "owner of the team") receives the result he expects. The dentist must understand the diagnosis, and be able to create an environment in which the outcome is predictable. Soft tissue management is a key to the success of dental prosthetic outcomes.

Fortunately there continue to be advances in dental science, technology and the clinicians' understanding of the relevant biology. Grafting of bone and soft tissue are common regenerative procedures. The tissues must be carefully managed post-surgically

throughout the surgical and restorative phases to meet the functional and esthetic requirements of the case. By providing a suitable provisional restoration during the healing period, soft tissue can be moulded and guided in a predictable manner.

The growth of periodontal tissue grafting technologies has been remarkable in the recent years. Autogenous, allograft, xenograft, and synthetic bone materials are frequently used to augment the tissue if the clinical situation requires it. Connective tissue grafts, including pedicle grafts, like those demonstrated by Dr. Stig Osterberg, Port Angeles, WA, allow the regeneration of an acceptable volume of soft tissue.

Previously the absence of adequate soft tissue would have been camouflaged with pink porcelain. It is not only possible, but considered standard of care, that patients be offered these services as part of the comprehensive treatment planning in the esthetic zone. A sequence of considerations for interdisciplinary treatment planning the management of soft tissue during the surgical and restorative phases of fixed dental prosthetics, with and without implants is presented in Figure 1.

Although acrylic resins such as SNAP

(Parkell Inc, Farmingdale, NY) have been used traditionally as provisional restorative materials, they are difficult to manipulate. The advent of bis-acryl resins in various consistencies, shades, opacities (translucencies), and filler particle sizes has made them an ideal material for short- and long-term provisionalization. They can self-cure by base/catalyst reactions in the absence of light, on demand with a curing light or a combination of self cure and light cure. An improved bis-acryl provisional restoration can be fabricated in the laboratory by enhancing light, pressure, and in a vacuum to increase the percentage of cured resin and decreasing porosity, thereby increasing strength. This makes it possible to repair, reline, make additions to, and tint the provisional restoration. The provisional can be customized to mimic natural teeth at least as well as porcelain, which is especially important in the anterior esthetic zone.

Pontic Site Tissue Guidance

When there is adequate gingival tissue volume overlying an edentulous ridge it is possible to create a soft tissue receptor site designed for the pontic to rest in and creat-

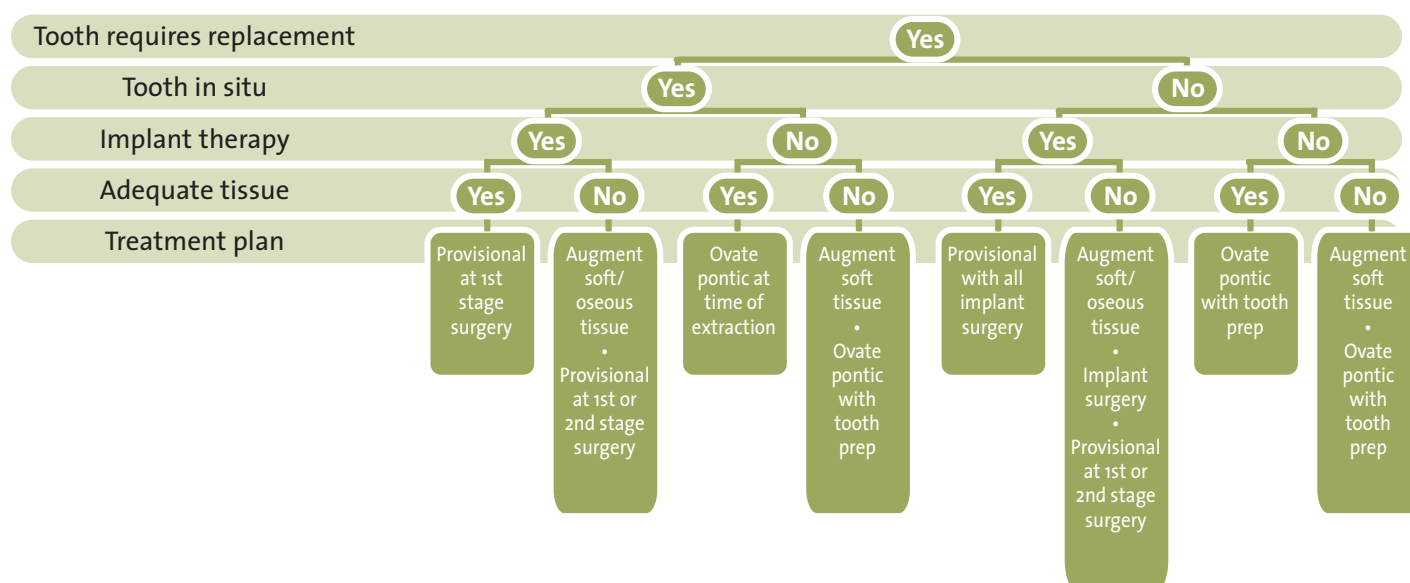


Figure 1. Interdisciplinary treatment planning for the management of soft tissue with provisionalization.

ing the illusion of a natural tooth erupting from intact periodontal tissues This pontic design is termed an “ovate pontic” and the prepared ridge is called an ovate pontic receptor site.

The site may be prepared at the time of tooth preparation by indenting the crest and labial of the residual ridge with a large, egg shaped diamond bur, sculpting with electro-surgery, or ablating with the diode laser. The provisional restoration is contoured in an “egg shaped” fashion and when it is placed onto the tissue it exerts slight pressure so that it blanches the tissue for no more than 5 minutes. The pontic should be smooth and polished.

The guidance of gingival tissue to create a pontic receptor site can also begin following tooth extraction if provisionalization can begin immediately. This requires the surgery to be co-ordinated with the prosthetic treatment. The provisional restoration is contoured in an ovate fashion and when it is cemented, it extends slightly into the fresh extraction site. The provisional restoration is checked for adequate contour and tissue support at 2-, 6-, and 12-week intervals.

In either case, when the patient returns for the final restoration, the site is healed and the final restoration should again exert slight pressure with blanching of the tissue, on the ridge. The blanching will disappear within 5 minutes if this is done correctly. This creates a very natural emergence profile for the restoration.

Case 1: Mature Ridge Recontouring

The patient presented with the upper right lateral incisor missing but replaced with a removable partial denture (Figure 2). As part of her phased treatment plan she wanted to begin with the replacement of the tooth but planned to proceed with restoration of the remaining maxillary anterior teeth as time and finances allowed. As she wanted whiter teeth, the definitive restoration would need to be a different shade than the unrestored teeth. She declined implant therapy to replace the tooth because she did not want the bone augmentation procedure that would have been necessary before predictable implant restoration. The ridge had healed with adequate soft tissue in the bucco-lingual and apico-occlusal dimensions. At the time of tooth preparation for the fixed restoration, the soft tissue was contoured with a large coarse diamond and

a bis-acryl provisional was contoured to press into the soft tissue preparation and encourage favourable healing (Figure 3). When the final restoration was tried in it blanched the tissue (Figure 4). After 5 minutes the blanching disappeared and the pontic had the illusion of a tooth emerging from periodontal tissue (Figure 5).

Case 2: Gingival Augmentation to Create a Soft Tissue Ridge

The patient presented with an implant in the upper right central incisor location. He wanted a comprehensive dental restoration. The implant was placed at the time of tooth extraction and had been placed too far apically and facially. As part of the comprehensive treatment plan, the remaining incisors were to be restored and would serve well as abutments for a bridge supporting the pontic in the right central incisor position.

When it was first examined, the implant had a healing abutment screwed to the implant in the upper right central incisor position and a pontic bonded to the adjacent teeth (Figure 6). Soft tissue augmentation to create coverage of the facial surface of the implant had been attempted but was unsuccessful. When the healing abutment was removed, however, there was adequate space and blood supply for a ridge augmentation using a pedicle graft from the palate. This was accomplished with success. The ridge could then be prepared at the time of provisionalization to create a pontic receptor site, as was done in case 1. The provisional was fabricated directly in the mouth and then allowed to guide the soft tissue maturation for several months (Figure 7). The timing of the soft tissue surgery and anterior provisionalization coincided with the posterior provisionalization. The posterior provisionalization was required in order to evaluate long-term occlusal stability in this bite opening case as is taught by Dawson.¹ In the definitive restoration the pontic gives the illusion of a tooth emerging from periodontal tissue (Figures 8 and 9).

Case 3: Planning the Intrusion of the Anterior Segment with Soft Tissue Management

The patient attended with mobility of the upper central incisors and inadequate periodontal support of all maxillary incisors. He had an angle class II skeletal pattern and dental class II, division 2 occlusion with



Figure 2. The right lateral incisor was extracted years earlier, and then replaced by a removable partial denture. There is inadequate bone for an implant without augmentation but adequate soft tissue remains for an esthetic restoration.



Figure 3. Two weeks after tooth preparation, tissue contouring and cementation of a bis-acryl provisional the tissue has healing favourable to an ovate pontic.



Figure 4. When the definitive restoration is tried in and fully seated the soft tissue will blanch for only 5 minutes.



Figure 5. To relieve the patient from wearing a removable prosthesis, the cantilever bridge was placed. The shade is the final shade for the comprehensive restoration planned to continue in the future and to include the remaining anterior teeth. Note the labial emergence profile of the restoration.



Figure 6. The implant had been placed too far apically and labially to be restorable. The resulting soft tissue defect is an esthetic challenge. An acrylic pontic has been bonded to the adjacent teeth to serve as a provisional restoration.



Figure 7. The healing abutment was removed and gingival augmentation surgery (pedicle graft) created adequate soft tissue volume. The provisional restoration helped guide the soft tissue during maturation following surgery. This working model demonstrates the resulting soft tissue contours achieved from adequate provisionalization.

typical² severe overbite and maxillary anterior crowding (Figures 10 and 11). The maxillary teeth have supra-erupted, along with their soft tissue support (Figure 12). He has excessive display of teeth and soft tissue upon smiling. Although there was to be posterior restorative treatment as part of the comprehensive treatment plan, there was no need to increase vertical dimension in order to create posterior restorative room (Figures 13 and 14).

The treatment plan required an increase in the anterior vertical dimension for restoration of function and aesthetics. This can be accomplished in one or a combination of ways^{3,4} including the following:

- Orthodontic: intrusion/relative extrusion
- Periodontal: Repositioning of the gingival margin (surgical crown lengthening)
- Restorative: increasing posterior restorative vertical dimension (“bite raising”)
- Surgical: segmental osteotomy and intrusion of the anterior segment

Interdisciplinary treatment planning of the case resulted in the decision to intrude the maxillary anterior by use of a combination approach to treatment. The incisor teeth were extracted (as they were periodontally compromised) and the soft tissue healing directed by use of a long term bis-acryl laboratory processed provisional restoration. This created the illusion that the periodontal apparatus was moved apically.

The case was planned in the same way as a denture set-up is planned. The teeth were removed from the model and the ideal location of the central incisors determined, using the “neutral zone” as taught by Dawson¹ as a guide (Figure 15). A full contour waxup was completed for the case (Figure 16). Laboratory processed bis-acryl provisional restorations (Radica Dentsply, York, PA) were fabricated (Figures 17 and 18). When the teeth were extracted the soft tissue was reflected sufficiently to allow osseous recontouring as guided by the surgical stent fabricated from the waxup. The adjacent teeth were prepared as abutments for the anterior bridge. The provisional restoration was relined with flowable bis-acryl material (Integrity, Dentsply, York, PA) (Figures 19 and 20) and cemented with temporary cement (Figure 21). Over the subsequent 4 months, the provisionals, which can easily be augmented and polished (Figures 22 and 23), were used to



Figure 8. Lateral view of the definitive restoration. Note absence of scarring in the area of the soft tissue augmentation around right central incisor pontic and the normal emergence profile.



Figure 9. Anterior retracted view of the definitive restoration at 3-years post treatment.



Figure 10. The patients chief concerns were his failing posterior teeth and his loose maxillary anterior teeth.

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Figure 11 Retracted anterior view. Note the severe overbite and crowding of the maxillary anterior teeth which is typical of the class II, division 2 occlusal pattern.



Figure 12. The anterior teeth, lacking contact with lower incisors have supra-erupted. The soft tissue margins of the incisors, except for the right central are incisal of their ideal location relative to the gingival margins of the cuspids bilaterally.



Figure 13. Lateral view demonstrating restorative needs.



Figure 14. In this lateral view, sufficient vertical room without bite raising for restoration is apparent.



Figure 15. Adjustment of the model to determine final position of the incisal edge was planned for the "neutral zone."



Figure 16. Full contour waxup of the final restoration for diagnosis and to create the contours of the provisional restoration.



Figure 17. Anterior view of the second laboratory processed Radica provisional restorations.



Figure 18. Close-up and reflected view of the provisional restorations showing the high degree of esthetic possible.



Figure 19. The bis-acryl provisionals are relined using the same technique used to bond to composite direct restorations including priming/bonding and application of flowable bis-acryl resin.



Figure 20. The relined restorations are seated in the mouth, allowed to self cure and then removed to trim to precise margins.



Figure 21. On the day of surgery the provisional restoration is seated, exerting pressure where necessary to direct the soft tissue to the contours planned on the diagnostic model.



Figure 22. The provisionals are removed at intervals of 2, 4, 8, and 16 weeks and checked for adequate soft tissue surface contour. They are relined to continue pressure in areas where required.



Figure 23. The bis-acryl provisionals can be polished with any composite polishing system or glazed with unfilled resin.



Figure 24. The soft tissue healing is complete. The provisionals have been relined as needed to create ideal contours as predicted in the diagnostic phase.



Figure 27. The final restoration, retracted view demonstrating the gingival contours.

guide the soft tissue healing. Differential pressure along the edentulous ridge from the pontics guided the soft tissue to heal in a more apical direction and symmetrically. After 4 months the process of soft tissue management with the provisional is completed (Figures 24 and 25). The definitive restoration creates the illusion of a tooth emerging from healthy periodontal tissue (Figures 26–29).

Peri-Implant Tissue Guidance

In the absence of other limiting factors, the earlier that a provisional restoration can be placed on a dental implant the more likely it is that the resulting soft tissue will be aesthetically acceptable. Although some changes are possible at the time of second stage surgery (cover screw removal), the ideal time is at the time of implant placement. If the implant is placed into a fresh extraction site it may be even more predictable. In the absence of infection and the presence of adequate bone and soft tissue, the transition to an inconspicuous implant borne restoration is most predictable if the soft tissue is supported adequately by a provisional prosthesis beginning at the time the tooth is lost.



Figure 25. The ovate pontic receptor sites seen on the crest of the ridge were created by the relining of the bis-acryl provisionals.



Figure 28. The final restoration demonstrating the illusion of teeth emerging from healthy periodontal tissue (right lateral view).

Case 4: Provisional Placement at time of Extraction and Implant Placement

This patient had injured his right central incisor and it had been restored with a crown and post (Figures 30 and 31). Fracture of the root necessitated extraction but the associated tissues were adequately healthy to permit the immediate placement of an implant at the time of tooth extraction. The same day that the tooth was extracted and the implant placed, the patient received a custom composite provisional restorations designed to mimic the natural tooth contours (Figures 32–35) in order that the soft tissue would be supported and guided during healing. The procedure for fabricating this restoration has been previously described⁵ and it is accomplished with layering restorative bis-acryl composite with hybrid filler particles is shown by Fahl.^{6,7} Following removal of the provisional at 6 months the natural appearance of the periodontal tissues is evident (Figure 36). The final restoration (Figure 37) predictably maintains the soft tissue contours.



Figure 26. The final restoration demonstrating the improved gingival tissue display.



Figure 29. The final restoration demonstrating the illusion of teeth emerging from healthy periodontal tissue (left lateral view).

Case 5: Provisional Placement at Time of Second Stage Implant Surgery

This patient was congenitally missing the maxillary lateral incisors. At age 13 years the teeth were replaced with bonded fixed restorations (Figure 38). The restorations were removed (Figure 39) in order that implants could be placed in the spaces preserved by the bonded restorations at age 18 years. At the time of 2nd stage surgery the soft tissue was guided by a provisional restoration made of hybrid composite layered onto a provisional abutment as was

done in case 4 (Figure 40).

In this case, the left lateral incisor had adequate soft tissue volume for an ideal result without soft tissue augmentation. At the time of 2nd stage implant surgery, there was found to be minimal soft tissue volume for the right lateral incisor; however. The connective tissue pedicle graft extending from the palate could have been used to create adequate soft tissue thickness in order that a provisional restoration could be used to guide the soft tissue healing following implant exposure (2nd stage surgery). The patient, however, refused the additional surgery deciding that the benefit of the surgery

would be minimal.

The composite provisional can be easily reshaped to create contours for tissue support and guidance. It can be augmented and reshaped by air abrading the surface, silanating and bonding to the old composite. If sufficient soft tissue thickness is present, by increasing the profile of the emergence, the soft tissue moves apically, and by reducing the profile the soft tissue moves in an occlusal direction. These adjustments are made in the provisional in order that the contours can be finalized prior to the final impression. The resulting soft tissue contours are captured in the final impression



Figure 30. Initial presentation of the failing right central incisor.

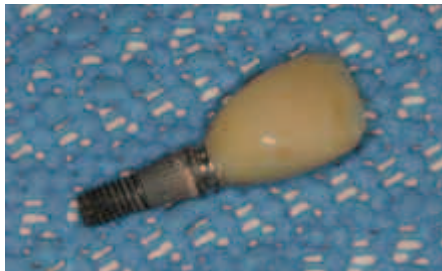


Figure 32. Provisional restoration (labial view). It is important in creating the provisional restoration that the anatomy of the tooth be duplicated. Interdental tissue support is created by mesial and distal contours and distinct line angles and height of labial of soft tissue is maintained by correct emergence profile.



Figure 33. Provisional restoration (lingual view).



Figure 31. Initial presentation radiograph.

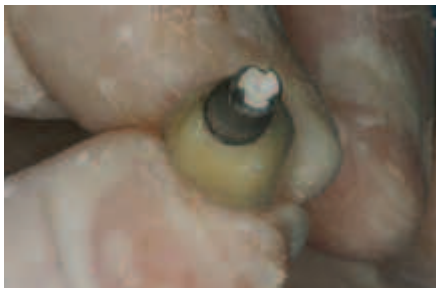


Figure 34. Provisional restoration (apical view).



Figure 35. Correct mesial and distal contours of the provisional restoration.



Figure 36. After 6 months the provisional restoration has created excellent soft tissue contours for the final prosthesis.



Figure 37. Final restoration.

using a rigid material, such as flowable light cure resin which is injected around the impression coping immediately after removal of the provisional, and then duplicated in the final restoration (Figure 41). The final restoration predictably achieves esthetic soft tissue profiles if there is adequate soft tissue to manipulate with the provisional restoration.

Conclusion

Patients demand that we provide improved esthetic services in restorative dentistry. With improved understanding of the biology, materials, and techniques to manage soft tissue during provisionalization it is possible to create a restoration that appears natural. The treatment planning for these procedures requires the coordination of specialist services.

The five cases presented demonstrate the management with provisionals, of soft tissue in cases which involve implants and those which do not, and in which the clinical situation permits management from the time of tooth loss and those which involve management until after the ridge is healed. All use bis-acryl composite technologies for the provisionalization procedures.

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Disclosure

The author declares no competing financial interests.

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Figure 38. Bonded bridges replace the right and left lateral incisors.



Figure 39. Bonded bridges are removed and the ridges are ready for implants



Figure 40. Provisional bis-acryl crowns were placed on implants following 2nd stage implant surgery. Note the gingival margin is more incisal than ideal on the lateral incisors.



Figure 41. Final restoration of the maxillary lateral incisors. The provisional restorations were used to manipulate the soft tissue margins by adjusting the contour of the emergence profile. On the left incisor, where there was sufficient soft tissue, the tissue is ideal, on the right where there was inadequate labial soft tissue, the gingival margin placement is more incisal than the idea.