IN-OFFICE PROVISIONALIZATION

Redesigning Existing Provisional Restorations While Maintaining Established Transmucosal Anatomy in a Multi-Implant System/Natural Tooth, Full-Arch Case

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Abstract: Redesigning existing provisional restorations when a combination of two different implant systems and natural teeth exist in the same arch can be challenging. Problems such as acrylic locking into undercuts and loss of spatial landmarks both subgingivally and supragingivally are common concerns for the practitioner. Two techniques, presented herein, offer treatment options to retain the previously developed transmucosal anatomies of implant-level provisional abutments while allowing for redesign of the clinical crown component of the same long-term provisional restorations. By modifying only the supragingival aspect of the provisional prosthesis, the previously developed transmucosal areas remain intact. Use of a segmented matrix from an approved wax-up offers greater control versus a single matrix of the entire arch.

Traditionally, shaping of the transmucosal area is a procedure that can be performed immediately following implant placement or at a future time. The procedure can be accomplished through the use of a prefabricated healing abutment, in-office customized provisional cylinder, or CAD/CAM-created abutment. Restoration of this transmucosal forming can be done specifically as an abutment without a crown or as an immediate abutment with either a provisional crown or bridge.[1-4]

Provisional restorations for implants and natural teeth can be fabricated in either the laboratory or the dental office. Laboratory provisionals require an impression or scan of both the existing supragingival and subgingival (transmucosal) areas previously established. In capturing the established subgingival topography in an impression, the practitioner needs to conduct a number of steps: remove the provisionals from the patient's mouth, place analogs onto the provisionals, embed this complex into a silicone putty, remove the provisionals from the analog, place impression cylinders onto the analog and build up the transmucosal aspect of the provisionals with a flowable composite, transfer this back into the mouth, and, finally, take an impression to be sent to the laboratory.[5] After the laboratory provisionals are later returned to the office, they may still need to be relined over natural tooth preparations.

As such, laboratory procedures can be associated with extra costs and added visits. These issues can be avoided with the use of in-office provisionals. The following case features a redesign of existing provisional restorations using an in-office approach. Use of a segmented polyvinylsiloxane (PVS) matrix formed from a wax-up presents the practitioner a manageable approach for redesigning provisional restorations. This technique, used synergistically with a second technique described in this article in which only the coronal aspect of a temporary prosthesis is prepared, allows the previously developed transmucosal area to be sustained around the provisional abutments. The existing screw-retained provisionals would be prepared in the mouth with a chamfer finish line placed supragingivally but near the gingival level.

Clinical Case Overview

The female patient in this case had all six maxillary molars removed and an implant placed in each of these locations. This was performed almost 4 years prior to having a more recent second round of implant placements in the premolar areas. When she was ready to begin this more recent treatment, several concerns of hers about

the existing provisionals and the natural teeth in her mouth needed to be addressed (the natural anterior teeth underwent gingivo/osseous reshaping).[6] The premolars were in linguo-version, and she was unhappy with her smile (Figure 1). The implants that had been placed in the molar regions were provisionalized as two screw-retained implant-level connected provisionals (Figure 2). They had worn significantly over the years because of bruxing (Figure 3), and this was accompanied by super-eruption of the opposing arch. These two laboratory-fabricated connected sets of provisionals had no significant sculpting of the transmucosal areas at the time of placement; they were screw-retained to allow easier access.

Fig 1. Preoperative condition demonstrating deficient buccal corridors, poor gingival margin contours, and unattractive shades, shapes, and tooth positions. **Fig 2.** Bilateral connected screw-retained posterior provisionals. **Fig 3.** Significant provisional wear after more than 4 years of attrition.

A second set of implants from a different manufacturer was placed more recently in sites Nos. 4, 5, 12, and 13. After several months of healing, these premolar implants were provisionalized using screw-retained implant-level provisional cylinders, and the transmucosal areas were sculpted to establish a proper emergence profile. Provisional titanium cylinders were used, which were opaqued using pink, white, and then a dentin-shaded opaque composite to block the low value of the metal.[7] The metal provisional cylinders were chosen over the polyether ether ketone (PEEK) type of cylinders because of the projected length of time the provisionals would need to be in the mouth, ie, approximately 8 months. The access holes were filled with polytetrafluoroethylene (PTFE) tape, and a clear stent from the approved wax-up was filled with a bis-acryl material to form the clinical crown aspect of the provisionals.[8-10] The adjacent provisionals were lubricated with petroleum jelly (Vaseline®). This stent was filled with the bis-acryl material in the premolar areas and then placed in the mouth over the teeth and left to harden.

These new provisionals were now removed by identifying the bright white PTFE tape and removing the newly added bis-acryl covering the access holes with a diamond bur to permit accessing the tape and screws.[11] Flowable composite was added to develop the emergence profile in the intaglio surface areas that would be typical of premolar teeth. These areas were refined to provide room for appropriate vascular physiology and then polished. Customizing these transmucosal areas was labor intensive, and it would therefore be desirable to maintain this developed anatomy during the re-provisionalization process. Teeth Nos. 6 through 11 would have full coverage due to weak and unattractive clinical crowns. While all the definitive restorations were planned to be individual ones except 1-2 and 15-16, the provisionals would be constructed in three segments for ease of handling during treatment.[12,13] The goal was to maintain the previously developed transmucosal areas and re-establish an ideal anatomy of the coronal aspect of the provisionals.

Treatment

Appropriate records were taken, including PVS upper and lower impressions of the existing provisionals and natural teeth. PVS bites, facebow transfer, photographs, and preliminary shades also were taken. The models were mounted on an articulator. This mounting was further enhanced by using a laboratory-fabricated deprogrammer to ensure that the most physiologically healthy centric relation position could be captured prior to the reconstruction.[14,15] The patient initially wore the deprogrammer for 3 days, but because there appeared to be some uncertainty as to whether the condylar complex had truly relaxed, she wore the device for another 5 days. This resulted in a repeatable indexing of the patient's bite. This position was captured in a PVS index and transferred onto the articulator.

A wax-up was then created using information from a mock bonding session, photographs, and a data gathering session discussing the patient's desires. Both the patient and clinician approved the wax-up (Figure 4). PVS laboratory putty material with a PVS wash was formed from the wax-up (Figure 5). At

least 4 mm of thickness was maintained throughout the putty to permit the eventual segmentation of the putty to be juxtaposed back into the segments' original relationship. The putty was trimmed to allow hydraulic pressure to escape by placing "v" cuts interproximally on the buccal using a scalpel. A "trial smile" was performed by placing this putty matrix filled with bis-acryl composite material over both the natural teeth and lubricated provisionals. This was approved by the patient and the "trial smile" material was photographed, impressioned, and then removed.[16-18] This technique is very helpful in confirming the incisal edge position of the anterior teeth.[19-21]

The posterior provisionals were then prepared to allow the putty formed from the wax-up to carry the acrylic to the existing provisionals. This was performed using a coarse chamfer diamond (Figure 6). The authors' suggested design is a taper slightly greater than a conventional taper used for traditional preparations of natural teeth. This approach offers more thickness of the overlaying acrylic, providing greater durability of the acrylic. The finish line is kept supragingival with the establishment of a 0.5 mm to 1 mm chamfered gingival margin. The occlusals are reduced approximately 1.5 mm and all sharp edges are rounded.

Three-Part Segmented Matrix

The approved putty was carefully segmented into three parts using a scalpel such that the putty could be rejoined with good reproducibility, similar to a 3-dimensional jigsaw puzzle (Figure 7). Segmenting the putty with a slightly undulating incision rather than using a straight line incision allows a more definitive rearticulation when juxtaposing the segments back into the mouth. One segment at a time was tried into the mouth, with eventually all three segments being tried in together (Figure 8). Any interference from the screw-retained partially prepared posterior provisionals still in place was adjusted by removing more acrylic. This was continued until the segmented parts of the putty indexed passively onto the palate and buccal gingiva. The adjoining edges of the three segments were then visually inspected to ensure a tight, accurate fit. This confirmation of the three parts of the putty is critical to achieving close approximation of the spatial replication of the approved trial smile and wax-up (Figure 9).

While it is simpler to use a full-arch matrix instead of segmented matrices, the authors have found through practical experience that a full-arch matrix filled with acrylic has a greater chance of locking into undercuts than a smaller segmented matrix. Combination cases of implants and natural teeth in the same arch and scattered throughout the arch, such as the present case, will typically involve implant and natural teeth inclinations being nonparallel with each other at this stage. This could result in acrylic getting locked between the nonparalleled implants/teeth.

Final impressions were taken along with records and bites using a split-bite technique, making optimal use of the previously deprogrammed provisionals.

The prepared posterior provisionals were thinly coated with an unfilled resin and polymerized using light-curing to provide

Fig 4. Maxillary wax-up. **Fig 5.** PVS putty with wash of approved wax-up illustrating relief from hydraulic pressure using both "v" vents and occlusal holes. **Fig 6.** Preparation of the provisionals intraorally without changing the subgingival substructure. **Fig 7.** Segmentation of the putty into three sections. **Fig 8.** Two of the three segments being tried into the mouth to confirm passive fit. Note the substantial thickness of the putty. **Fig 9.** Placement of all three segments together to ensure close approximation of the cut segments.

a stronger bond with the overlayered bis-acryl. The access holes were filled to the occlusal aspect of each newly shaped provisional with PTFE tape, which because of its stark white appearance allows the operator to locate the access holes visually and drill into the appropriate area to remove the tape and access the screws. One of the posterior segments was first filled with the bis-acryl and placed with light force into position over the prepared provisionals (Figure 10 and Figure 11). The other two unfilled segments were then simultaneously placed in the mouth to provide improved dimensional positioning of the first filled segment but were kept unfilled at this time. This step offers the benefit of a full-arch matrix but without the aforementioned liabilities.

Once the bis-acryl in the first segment was fully hardened, all three PVS segments were removed from the mouth and placed aside awaiting the second of the three areas to be rebuilt (Figure 12). The previously placed PTFE tape was visualized beneath the thin occlusal layer of bis-acryl and accessed with a 3-mm-long diamond chamfered bur to allow removal of the tape and subsequent loosening of the screws (Figure 13). This cylindrical diamond was used instead of a round bur because in the authors' experience a round bur often creates too much undercut, tending to create inner chamber wall concavities, which could allow the temporary filler material to inadvertently lock in and make removal of the material difficult. The modified provisional was removed from the mouth and the newly added acrylic was trimmed and refined using flowable composite resin (Figure 14).

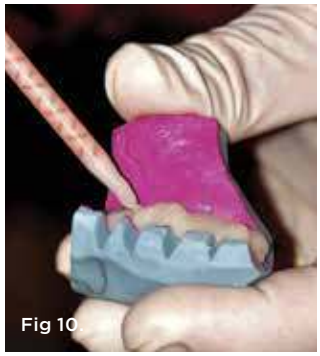
Fig 10.


Fig 11.


Fig 12.


Fig 13.

Fig 10. Filling of the first segment with bis-acryl. **Fig 11.** Placement of the filled segment into the mouth. **Fig 12.** Retained acrylic immediately following removal of the first filled segment. **Fig 13.** Loosening of the screws.

Fig 14. Refinement of provisional with flowable composite.
Fig 15. Final result.

This modified trimmed and polished provisional was replaced back into the mouth, and all three PVS segments were repositioned in the mouth to again check that there were no interferences. The other posterior side was then fabricated in the same manner as the first. The third and last PVS segment, which in this case was the anterior natural tooth section, was again tried in with the now two finished posterior segments in place over their respective provisionals to ensure there were no interferences but also to provide accurate indexing to achieve the proper pitch and yaw of the anterior segment. The adjacent surfaces of these two already modified provisionals were lubricated because it is desirable to maintain individuality of the three segments and not fuse them together. The third and last PVS segment, which was now positioned, was removed and allowed to harden out of the mouth before it had the opportunity to fully set and lock into place; this enables the operator to refine the margins and finish the anterior provisional out of the mouth and avoid having the acrylic lock into undercuts. This segmented approach also circumvents any possibility of a nonparallel withdraw between the natural teeth and adjacent implant segments as discussed earlier.

After the three sections were refined to the patient's liking, the posterior sections were torqued to 15 Ncm. The access chambers were filled with PTFE tape to within 2 mm of the occlusal surface, and a stiff elastomeric material was placed in the remaining access chamber space.

Final Prosthesis

One week later the patient returned to the office after having an opportunity to test the new design for phonetic acuity, esthetics, and function. The bite was scrutinized and adjusted to allow accurate bite recordings. The temporomandibular joint (TMJ) apparatus might have been inflamed during the previous lengthy visit. Therefore, a follow-up appointment would give the elevator muscles and suspensory ligaments/muscles in the TMJ complex a greater opportunity to return to physiological health. This may permit the condyle/disc assembly to resume the most physiologically healthy position possible and allow equilibration of the occlusion to be more effective and remain more stable. The TMJ record along with other records, such as esthetic contouring, final provisional models, shades, and photographs, were documented and sent to the laboratory.

The patient returned for the try-in and insertion of the final prosthesis. Teeth Nos. 1 through 5 and 12 through 16 had titanium/zirconium abutments with zirconium crowns cut back with compatible coefficient thermal expansion veneering porcelain. Teeth Nos. 6 through 11 comprised pressed lithium-disilicate crowns cut back with compatible veneering porcelain.[22] The patient was pleased both with the final results (Figure 15) and that she was able to contribute to the final design of her smile. The restorative clinician felt that being able to both transfer the approved wax-up accurately to the mouth for the redesign and avoid the need to re-establish the transmucosal anatomy of the provisional was a significant benefit.

Conclusion

This report of a case involving a provisional restoration redesign described a method of preparing an existing provisional's coronal aspect without disturbing the previously developed transmucosal anatomy. The technique can be of significant value if the soft tissue has already been approved by the practitioner. The redesigning of the coronal aspect of a pre-existing provisional illustrated an effective approach to maintaining the transfer from an approved wax-up to a trial smile to the actual prosthesis.

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