

Comprehensive Reconstruction Using Sequential Extraction and Implant Placement

Abstract: Several restorative options are available for managing the debilitated dentition when multiple teeth will need to be extracted. Generally, the teeth can be replaced using a removable prosthesis or some type of fixed restoration. The fixed restoration can either be supported by the remaining teeth, if the number and location of the remaining teeth are amendable, or by the use of osseointegrated implants. For patients who do not want a removable appliance as the final restoration, implants are the treatment of choice.

Traditionally, if an implant-supported restoration was desired, the required extractions were made and the patient was transitioned to the final restoration by the placement of an immediate full or partial denture. If immediate implant placement did not occur, the implants were placed after an initial healing period. The implants were then allowed to remain undisturbed for a period of 4 months in the mandible and 6 months in the maxilla to allow for osseointegration.¹⁻³

To bypass the need for a transitional removable appliance, studies have been conducted to assess the osseointegration of immediately loaded implants.⁴⁻⁷ Although immediate loading protocols were first applied to the restoration of the edentulous mandible, it has also been shown to be effective in the restoration of the edentulous maxilla.⁸⁻¹¹ When immediate implant loading is associated with fully edentulous arches, implant splinting that achieves cross-arch stabilization is needed to control the transverse forces and limit micro-movement

at the implant-bone interface. The predictability of the protocol drops if primary stabilization of the implants is not achieved. The main benefits of immediate implant loading in the full arch are that it can bypass the need for an interim removable appliance and it can help support and maintain the position of the soft tissues in the esthetic zone. However, this technique can be extremely difficult in situations where significant hard/soft tissue augmentation is required.

As an alternative to the above-mentioned protocols, there is one other technique that alleviates the need of a transitional removable appliance, maintains and supports the soft tissue, allows augmentation where needed, and eliminates problems with osseointegration owing to early occlusal loading. This approach involves the selective extraction of some teeth followed by immediate implant placement. The remaining teeth are temporarily maintained to support a fixed provisional while the first set of implants is integrating. Once osseointegration of the implants is

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Figures 1A, 1B, and 1C—Initial presentation reveals an extensively restored dentition with generalized moderate-severe caries at the crown margins. Generalized moderate gingival inflammation was present with probing depths ranging from 5-9 mm.



Figure 2A—The extent of the caries can be visualized upon removal of the existing restorations. Teeth Nos. 9 and 10 are the only teeth on the maxillary arch that will not require extraction.



Figure 2B—To maximize the number and disbursement of the abutment teeth and utilize the existing edentulous areas, only teeth Nos. 8, 13 and 14 were to be extracted in the first phase of treatment. Note that No. 7 was temporarily built up to help support the provisional.



Figure 3—The first stage of treatment included a ridge split in the Nos 5-6 and 11-12 areas as well as placement of implants in the Nos. 5, 6, 8, 11, and 13 sites. Following implant placement, the provisional, solely supported by the remaining abutment teeth, was recemented.



Figure 4—After 6 months of integration, temporary abutments were attached to the implants. The provisional was then relined to allow the implants to support the occlusal load.



Figure 5—When the second phase of implants were integrated, temporary abutments were placed and the existing maxillary provisional relined. At the same appointment the lower arch was also prepared and provisionalized.

achieved, abutments can be placed on the implants and the provisional relined so that it is the implants that support the provisional. This will then allow the remaining teeth to be extracted and the second set of immediate implants to be placed. Following integration, the second set of implants can be used to support the provisional before definitive restoration with an implant-supported prosthesis. Although there are many advantages to this protocol, the main disadvantage is the extended treatment time that is required with two separate stages of implant placement.

This case will demonstrate the treatment sequencing that is necessary for sequential extraction and implant placement in a debilitated dentition. In addition it will describe a technique that can be used to transfer the emergence profile of the provisional and the resultant position of the soft tissues around the implants to the technician for fabrication of the definitive restoration.

Case Report

A 66-year-old man presented with extensive restorations in the entire maxillary and mandibular posterior arch, which had been in place approximately 30 years (Figures 1A through 1C). Clinical and radiographic examination revealed generalized moderate-severe recurrent caries at the existing crown margins as well as around areas that had been secondarily patched. In addition, generalized moderate-severe bone loss was diagnosed in the maxillary and mandibular posterior. The only teeth not previously restored were the mandibular anteriors. Aside from the presence of moderate incisal attrition, no caries or bone loss was present on these teeth.

Given the severity of the caries and the localized advanced bone loss, the treatment plan was to extract all of the maxillary teeth, with the exception of teeth Nos. 9 and 10, as well as the remaining mandibular molars. Since the patient requested not to have any type of removable appliance, implants were used to replace the missing teeth. Sequential extraction and implant placement were planned to allow a sinus lift in the area of tooth No. 3; augment (ridge-split) in the areas of teeth Nos.



Figures 6A and 6B—To fabricate customized impression copings to transfer more accurately the soft tissue profile, the provisionals and temporary abutments are removed from the mouth. After attaching fixture replicas to the abutments, the provisionals are mounted in fast set mounting stone.



Figures 7A and 7B—A fast-setting silicone is injected around the provisional restoration including the ovate pontic. The silicone will capture the external contours in the gingival third of the provisional.

5-6 and 11-12; preserve the soft tissue architecture in the area of teeth Nos. 6-7; and forgo the use of an interim partial denture. After the mounting of study models and subsequent diagnostic waxing to incorporate the desired esthetic and functional changes, all of the existing restorations on the maxillary arch were removed (Figure 2A and Figure 2B).

First Treatment Stage

To leave as many strategic abutments as possible and maximize the edentulous spaces already present, it was decided that teeth Nos. 8, 13, and 14 would be extracted during the first stage of treatment and implants placed

in the Nos. 5, 6, 8, 11, and 13 sites. Caries control was performed on the abutment teeth that would be maintained, and a one-piece splinted provisional restoration (Protemp™ 3 Garant™, 3M ESPE, St Paul, Minnesota) was fabricated and temporarily cemented (TempBond®, Kerr Corporation, Orange, California). The following day the patient was seen by the surgeon to extract teeth Nos. 8, 13, and 14, increase the width of the ridge in the Nos. 5-6, 11-12 areas with a ridge split, and place implants in the Nos. 5, 6, 8, 11, and 13 sites. In addition, a sinus lift was completed in the area of Nos. 3-4. At the completion of the surgical treatment, the provisional was recemented with long-term temporary cement (Fynal®, Dentsply Caulk, Milford, Delaware) (Figure 3).

Second Treatment Stage

After 6 months of integration, the second stage of extraction and implant

placement was initiated. The provisional restoration was removed and abutments were placed on the implants (Figure 4). The provisional was then relined over the implant abutments to transfer the load from the remaining abutment teeth to the implants themselves. The patient was then seen by the surgeon to extract teeth Nos. 4, 7, and 12 and place implants in the Nos. 3, 4, 12, and 14 sites. The second molars were to remain in place to help support the provisional until the second phase of implants were ready to be loaded, at which point they were to be extracted. Abutments were placed on the second phase of implants after 6 months and the provisionals relined. At this point, specific attention was given to the subgingival contours of the provisional to support the soft tissues. In addition to finalizing the provisionals on the maxillary arch, the lower arch was also prepared and provisionalized (Figure 5).

Final Impressions

After verifying the esthetics and occlusion of the provisionals, the final impressions were taken. The purpose of the final impression is not only to transfer the position of the implant fixtures and the prepared teeth to the technician but also to transfer accurately the position of the soft tissue architecture and the ovate pontic receptor site in the area of No. 7. The position of the soft tissue architecture had been created by the subgingival emergence profile of the provisional restorations. Customized impression copings were fabricated to ensure collection of all the necessary information.

To fabricate the customized impression copings, the provisional restoration and temporary abutments are first removed from the mouth. The temporary abutments are attached to fixture replicas and mounted in fast set mounting stone (Figure 6A and Figure 6B). A fast-setting silicone (Mach-2®, Parkell Inc, Edgewood, New York) is then injected around the provisional restoration to capture the external contours of the gingival third of the provisional (Figure 7A and Figure 7B). Once the material has set, the provisional and temporary abutments are



Figures 10A and 10B—With the customized impression copings seated in the mouth, optimum support of the soft tissues is achieved and maintained throughout the impression-making process. Given the flat gingival architecture and the shallower implant placement, conventional impression copings are used in the posterior.

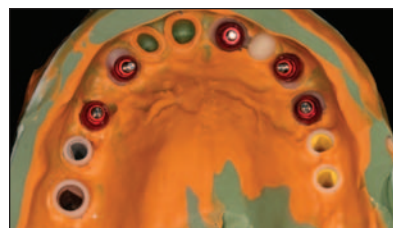
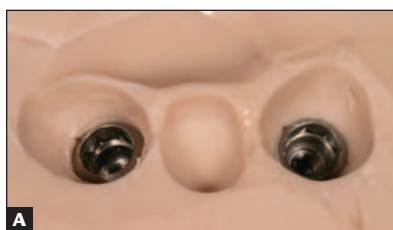


Figure 11—When the impression is removed from the mouth, the subgingival portion of the customized impression copings can be seen. A soft tissue replicating material and die stone can be placed directly against these surfaces to transfer the contours of the soft tissue to the master model.



Figures 8A and 8B—When the silicone has set, the provisionals are removed revealing the exact contour of the provisional that is supporting the soft tissues in the mouth. To use these contours, pick-up impression copings are attached to the implant analogs.

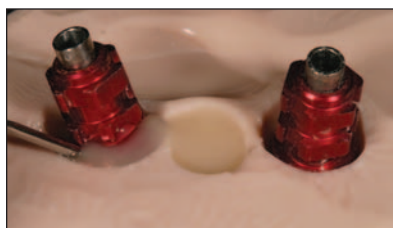


Figure 9—When the impression copings are in place, light-cured composite resin or auto-cured acrylic resin can be flowed into the space between the impression copings and the silicone. The composite is also carried into the ovate pontic site and left attached to the material around the implant for support.

removed and “open tray” impression copings can be attached to the fixture replicas (Figure 8A and Figure 8B). A light-cured composite is then flowed around the impression copings and into the ovate pontic site and cured (Figure 9). The impression copings can then be attached in the mouth. Since the subgingival contour of the customized impression coping exactly matches the contour of the provisional restoration, the soft tissues are supported throughout the entire impression-making process (Figure 10A and Figure 10B).

The remaining abutment teeth and impression copings were picked up in the final impression (Aquasil Ultra, Dentsply Caulk, Milford, Delaware) (Figure 11). The customized impression copings were only fabricated for the anterior implants given the difference in depth of the anterior implants compared with the posterior implants

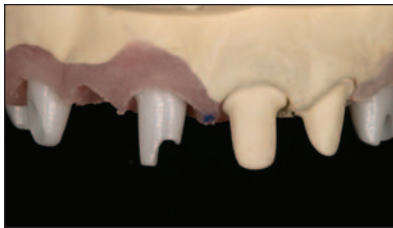


Figure 12—The master model shows the prepared teeth as well as customized zirconia abutments that have been fabricated to support a cement retained implant restoration. Note the contours of the soft tissues in the implant and ovate pontic site that was transferred by the customized impression copings.

as well as the difference in gingival architecture in the front of the mouth compared with the back. Before pouring the master cast, soft tissue replication material (Gingitech™, Ivoclar Vivadent Inc, Amherst, New York) was used to represent the gingival tissues. The direct benefit of using the customized impression copings is that the technician can then fabricate the implant abutments and final restorations without having to adjust the tissue on the master model (Figure 12). The restorations will support the tissues just like the provisionals in the mouth as long as they are designed to intimately contact the contours of the soft tissue as captured by the customized impression copings. The final restorations consisted of customized zirconia implant abutments and all-ceramic crowns and bridges (Lava™, 3M ESPE, St Paul, Minnesota) (Figure 13).

Final Restorations

Upon removal of the provisional restorations, the zirconia implant abutments were seated in the mouth. The fit of the abutments was verified clinically and radiographically. Once verified, the abutments were torqued to 35 Ncm. The final restorations were seated on the abutments and the esthetics and occlusion evaluated and adjusted



Figure 13—The final restorations consisted of customized zirconia abutments with Lava™ all-ceramic restorations. Other than two three-unit bridges, all restorations were kept as single units.

as needed. A mutually protected occlusion was designed. The final restorations were cemented, making sure to remove all remnants of subgingival cement (Figures 14A through Figure 14C). A temporary cement (Temp-Bond® Clear, Kerr Corporation, Orange, California) was chosen to allow removal of the restorations if an abutment screw were to come loose sometime in the future.

Conclusion

Sequencing the extraction of teeth and placement of implants can be very beneficial. In addition to easing the transition to a fully implant-supported restoration without the need for a removable appliance, it does so without the increased risk of prematurely overloading the fixtures before osseointegration. In addition, it can also allow for augmentation in areas that require implant site development. With regard to esthetics, using a fixed provisional restoration throughout the course of treatment allows continual support of the soft tissue architecture. Being able to maintain the soft tissue scallop and transfer the information to the technician helps alleviate many potential problems and can increase the predictability of the final restorative result.

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Figures 14A, 14B, and 14C—The final case as seen at a post-insertion follow-up. The esthetic, functional, and structural goals set forth in the treatment plan have been attained.