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IMMEDIATE RESTORATION OF IMPLANTS UTILIZING A FLAPLESS APPROACH TO PRESERVE INTERDENTAL TISSUE CONTOURS

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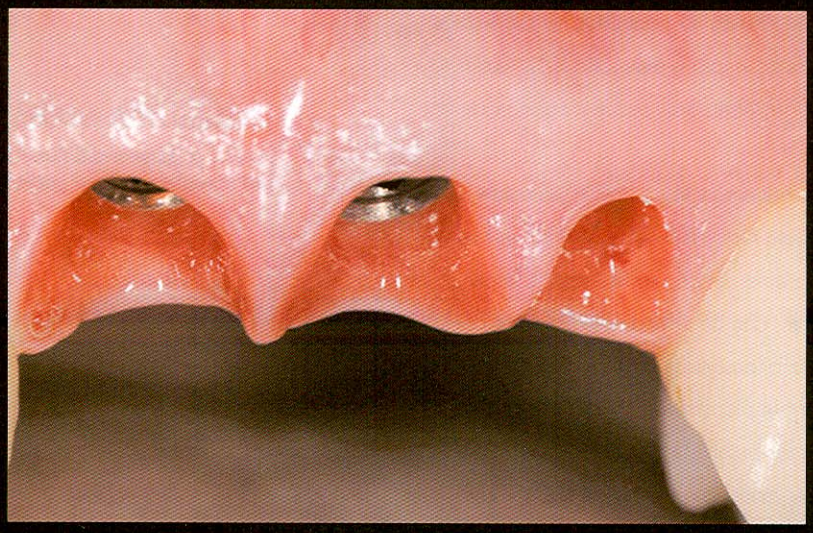

Dental implants have become widely accepted for the replacement of missing teeth due to their high success rates. Conventional multistage approaches to implant reconstruction have contributed to professionals' acceptance of implant dentistry as a treatment option, yet innovative implant procedures often enable clinicians to achieve function and aesthetics in shorter treatment periods. This presentation describes recent advances in surgical procedures and provisionalization techniques that, when applied properly, provide soft tissue integration and long-term implant success.

Learning Objectives:

This article describes surgical procedural advances that provide long-term implant success. Upon reading this article, the reader should be able to:

- Identify the advancements associated with surgical procedures and provisionalization techniques.
- Understand how these advances contribute to soft tissue integration and long-term implant success.

Key Words: implants, provisionalization, soft tissue integration

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Recent advancements in implant surgical protocols have allowed the surgeon to provide the restorative clinician with a fixed nonloaded restoration during surgery. Numerous authors have presented surgical guidelines that allow the implant team to present predictable and aesthetic provisional restorations during surgery.[1-5] The placement of a fixed provisional at implant placement has been shown to contribute to the early foundation for aesthetic implant restorations by aiding in the creation of aesthetic soft tissue contours and emergence profiles.[1-5]

Several authors have described how parameters for success in natural tooth restorations, regarding the foundation for soft tissue emergence profiles and a healthy, mature biologic width, can be extrapolated to the placement of implant restorations for single-tooth replacement or multiple adjacent implant sites.[6-9] Incorporating the dimension of the final prosthetic restoration, with aesthetic considerations, must be accomplished prior to the inception of surgical procedures. Surgical template designs that allow the surgeon to translate the dimensions of the final restoration to the surgical field have been shown to be effective in allowing this type of communication within the implant team. Surgical rationales for immediate placement and provisionalization of anterior single-tooth implants[3] and for posterior implants in the sinus-grafted region have also been presented.[5] The following surgical and provisionalization protocol has been followed routinely by the author to deliver aesthetic implant restorations.

Pretreatment Planning

The surgeon should conduct a complete medical and dental evaluation before performing the implant restoration (Figures 1 and 2). Maxillary and mandibular study models should be obtained and mounted on an articulator. Evaluation of the surgical site involves referral to the dental laboratory for a diagnostic waxup of the hard and soft tissues that need to be replaced.[10] After the diagnostic waxup has been evaluated, the laboratory

Figure 1. Case 1. A 32-year-old female patient presented for a single-tooth implant to replace a fixed partial denture at tooth #7(12).

Figure 2. In comparison to the contralateral incisor, tooth #7 was short and demonstrated a lack of aesthetics and symmetry.

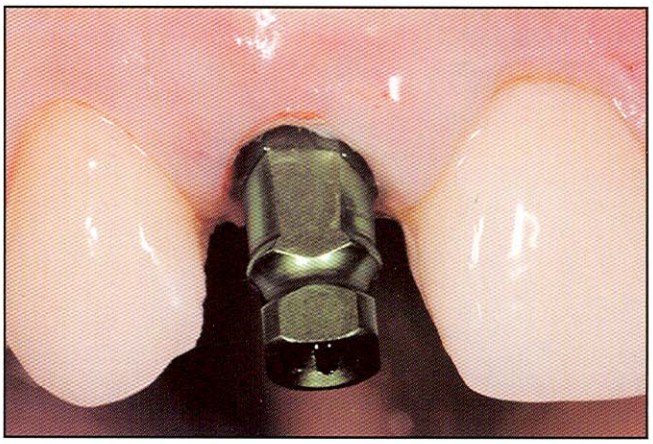

Figure 3. Patient had undergone previous soft tissue grafting that was contoured to support a tapered implant.

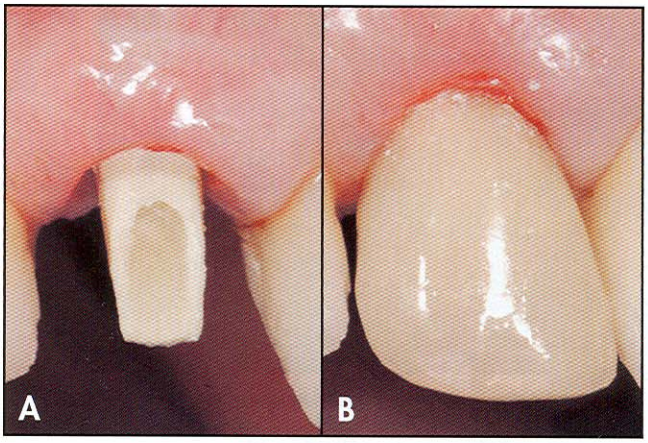

Figure 4A. A fixture-level impression was taken, and a plastic temporary abutment was prepared and polished extraorally prior to seating. 4B. The immediate, nonloaded provisional restoration was seated at the site of tooth #7 with temporary cement.

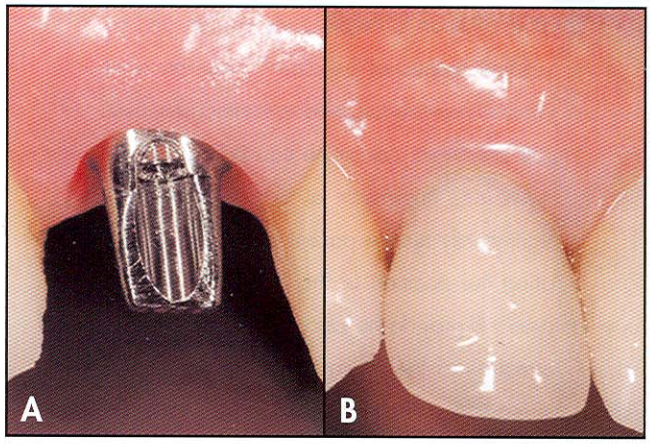

Figure 5A. At 1 month postoperatively, the tissue-sculpting abutment (ie, Atlantis, Zimmer Dental, Carlsbad, CA) was placed. 5B. One month after implant placement, the tissue-sculpting provisional was seated. Note the tissue contours and emergence profile.

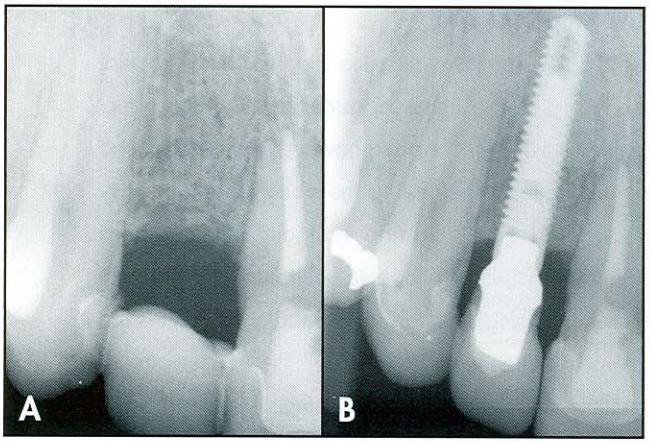

Figure 6A. Preoperative radiograph. 6B. Periapical radiograph taken at 3.5 months following surgery exhibits alveolar bone contour.

converts it to a surgical guide/temporary restoration. This process allows the restorative clinician to communicate to the surgeon the parameters necessary for a successful and biologically sound implant restoration.[11] It also enables the surgeon to predetermine the angulation and spatial position of the implant, as well as to visualize the position of the implant collar and its relationship to the sulcular portion of the planned restoration and interdental/interimplant bone contours. Additionally, the stock abutment can be prepared and the temporary approximated before the initial surgical visit.

Surgical Technique

- Preoperative antibiotic administration;
- Atraumatic tooth removal, sinus elevation, or edentulous site preparation; and
- Debridement of existing periodontal/periapical infection and/or periodontal ligament.

Implant Selection and Placement

In the author's experience, the implant of choice for this technique should have a self-tapping thread design. The implant should be able to obliterate the apical portion of the socket, and mimic the convergence of a natural tooth (Figure 3). It is recommended that the implant surface be roughened with surface enhancements in an attempt to promote a rapid integration, and enhance the initial stabilization of the fixture. The author has also observed that the polished implant collar should be no greater than 1 mm in height. This should allow the final position of the polished collar to be just superior to the crest of the bone and allow for soft tissue attachment in the region of the collar, while the roughened implant surface allows for bone attachment. Placement of the implant collar should be as follows: the superior position of the polished collar should be equal to a line drawn from the facial height of contour (ie, buccal bone height at the midfacial point) of the contralateral tooth to be replaced (eg, central/central/lateral/lateral).

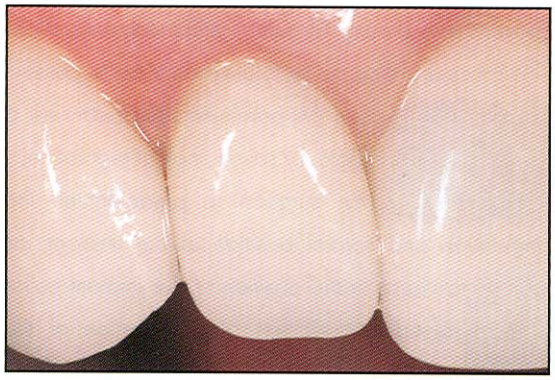

Figure 7. The definitive restoration at 3.5 months postoperatively. Enhanced aesthetics was achieved with the nonincision approach to immediate implant placement.

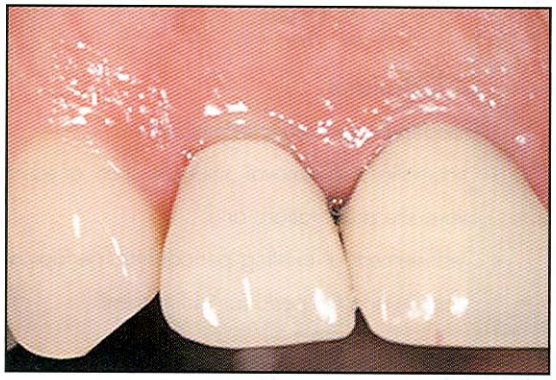

Figure 8. Case 2. A 37-year-old nonsmoking female patient presented for implant reconstruction at teeth #7(12), #8(11) and #9(21).

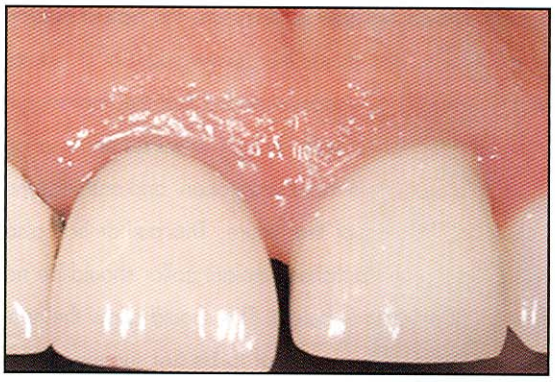

Figure 9. Preoperative facial view of the aesthetic zone. The patient had a history of trauma to the area, with advanced bone loss and tooth mobility.

Fixture-Level Impression

The transfer of surgical information to the restorative clinician and laboratory technician can begin at the time of implant placement. Important information regarding implant position in relation to the surrounding dentition, an adjacent implant, alveolar bone levels, and existing and/or planned soft tissue contours, can allow the restorative clinician to create study models and initiate the prosthetic aspect of the case.[12,13] Custom abutments, additional provisionals, and in some cases, even the definitive prosthetic restoration can be constructed from the fixture-level impression at surgical placement. This can significantly reduce patient treatment time. An index relating the position of the implant to the surrounding area will provide the laboratory technician with basic information of the implant site. An entire arch impression, registering fixture position, can provide great detail regarding the planned treatment area. An opposing arch impression and accurate bite registration are also required.

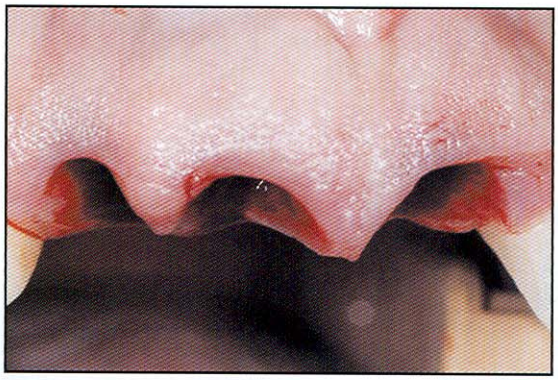

Figure 10. Atraumatic tooth extraction was performed to facilitate immediate implant placement using a flapless approach to preserve the interdental papillae.

Grafting Material

Autogenous bone is often the ideal grafting material due to its osteoconductive, osteoinductive, and osteogenic properties.[14,15] It does, however, require a second surgical site for harvesting the bone tissue and may increase surgical time and morbidity. Other options include the use of allogenic, alloplastic, and xenographic grafting materials, either with or without the use of various regenerative barriers.[16] The nonautogenous grafting material should be biocompatible with the host tissue as well as being osteoconductive,[17-19] osteoinductive,[20] and osteotrophic.[21] While all allogenic or

Figure 11. Image depicts a provisional restoration (ie, TempStent) used to accomplish osteotomy site preparation.

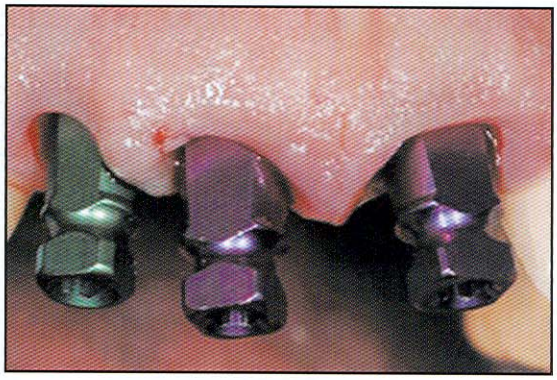

Figure 12. Three implants (ie, Tapered Screw Vent, Zimmer Dental, Carlsbad, CA) were placed into the extraction sockets prepared with platelet-rich plasma (PRP).

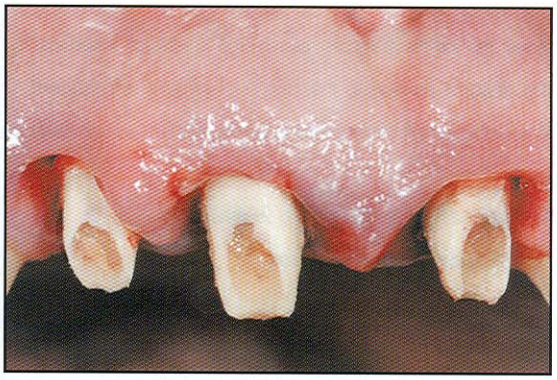

Figure 13. Fixture-level impressions were made for the tissue-sculpting abutments that would be placed 1 month postoperatively. Three temporary abutments were seated.

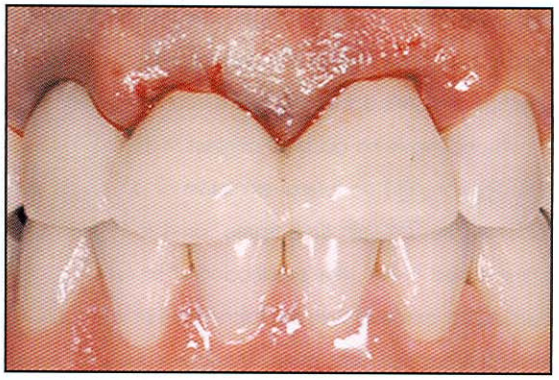

Figure 14. An allogenic graft and PRP were placed, and the relined provisional restoration was cemented as an aesthetic, nonloaded temporary restoration.

alloplastic grafting materials possess these qualities, some must rely on a vehicle to reconstitute their granular form. It has been observed that platelet-rich plasma can enhance the osteoconductive, and possibly the osteoinductive properties of various allogenic, alloplastic and xenographic materials.[22-25]

Platelet-rich plasma (ie, autologous platelet gel) is derived from autologous blood with a cell separator. Centrifugation of 55 mL of whole blood will yield 10 mL of platelet-rich plasma that, when simultaneously mixed with thrombin and calcium chloride, results in the degranulation of the platelets and subsequent release of growth factors that stimulate hard and soft tissue maturation and promote healing.

Abutment Selection

Abutment selection can include the carrier mechanism of the implant system, a dedicated provisional abutment, or a stock abutment (which can also be used as a final abutment). Using any of these abutments requires its preparation. Incorporation of the temporary/surgical guide system used by the author allows preparation of the stock abutment to be accomplished in the dental laboratory (Figure 4A). This eliminates the repeated removal of carrier mechanism, intraoral preparation of the abutment (which produces heat and micromovement via vibration), and impression copings for implant indexing at the time of placement. It is important to remember that with immediate tooth extraction and immediate implant placement (especially in sinus elevations), the quality of the bone is often compromised. Thus, whatever the surgeon can do to minimize external forces to the fixture will be beneficial. In cases where the stock abutment provided

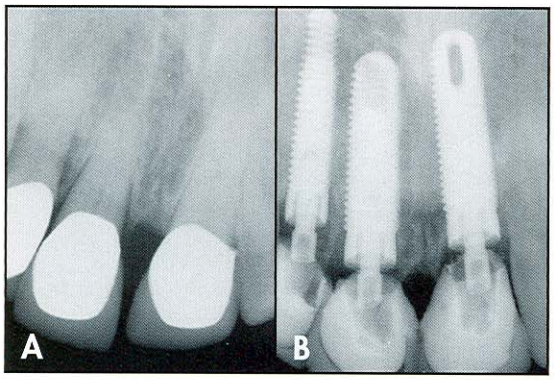

Figure 15A. Preoperative periapical radiograph. 15B. Immediate postoperative radiograph of the seated implants.

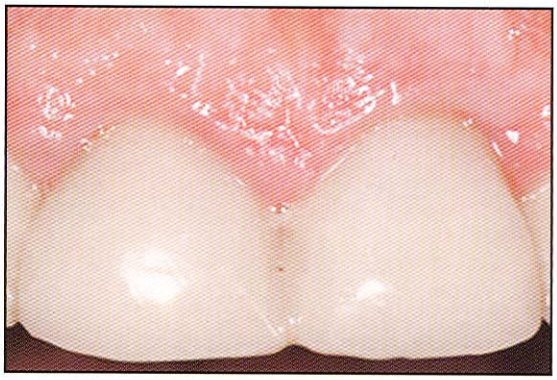

Figure 16. The 10-day postoperative view evidenced the excellent, as well as mature, soft tissue contours at the early time frame.

Figure 17. At 5 weeks after implant placement, the initial provisional restoration was removed for placement of the tissue-sculpting abutments and provisional restoration.

does not allow for an appropriate path of insertion for the restoration due to the angle of implant placement, a stock-angled abutment that is easily prepared will suffice.

Temporary Restorative Material/ Temporary Construction

The author favors the TempStent method for the efficient transfer of a surgical guide into an aesthetic provisional restoration that closely mimics that of the planned final restoration in regard to emergence profile formation, interdental contours, contact points, and gingival contour at the facial marginal aspect. Upon completion of the temporary restoration (Figure 4B), care must be taken to evaluate the patient's occlusion. It is recommended that the provisional have no occlusal contact in the centric relation position and no lateral excursive or protrusive contacts. At the 3-month time frame, or 4 to 5 months in sinus-grafted cases, the prosthodontist or reconstructive dentist can proceed with the fabrication of the definitive implant-supported restoration. The provisional restoration can be cemented with a temporary cement, and confirmation of nonloading be obtained.

Tissue-Sculpting Abutment

At one month postoperatively, a tissue-sculpting abutment (ie, Atlantis, Zimmer Dental, Carlsbad, CA) and provisional restoration replaces the initial provisional abutment/temporary complex (Figure 5). The foundations for aesthetic tissue contours are evident after removal of the initial provisional restoration. If necessary, additional tissue sculpting can be accomplished in the remainder of the 2-month healing phase by adjusting the provisional restoration in the area of the emergence profile of the soft tissue.

Definitive Restoration

Fabrication and placement of the definitive implant restoration (ie, abutment/crown complex) is routinely completed within a 3-month period (5 months in sinus-grafted cases) (Figures 6 and 7). The abutment constructed with CAD/CAM technology is often used as the final abutment for a metal-ceramic restoration. Depending on the aesthetic requirements of the case, an additional all-ceramic or gold abutment with

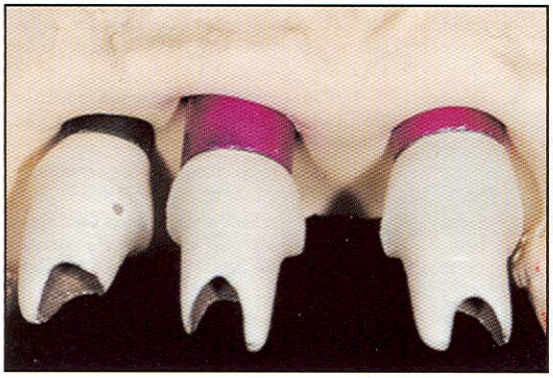

Figure 18. The reconstructive dentist obtained a new fixture-level impression and prepared custom-opaqued abutments with porcelain-butt junctions.

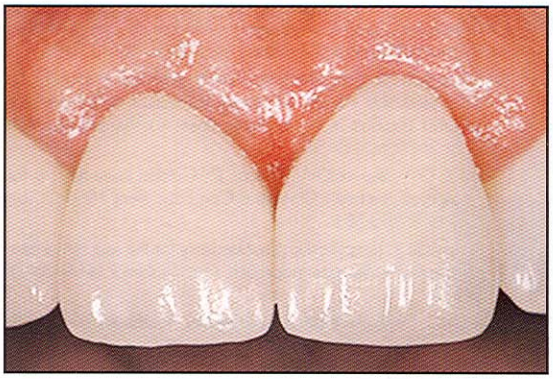

Figure 19. Image shows the final implant restorations at teeth #7 through #9. Note the excellent tissue contours and emergence profiles.

opaquing for enhancement of aesthetics can allow an all-ceramic restoration to be constructed. If the restorative clinician prefers a custom abutment, the patient is referred back to the restorative clinician for routine impression techniques at fixture level with a transfer coping. Once the custom abutment is fabricated, it is seated and torqued at 30 Ncm, and completion of the implant-supported restoration proceeds as normal. Occlusal evaluation of the final restoration is imperative for long-term clinical success. A restoration that has the proper occlusal function in centric relation, protrusive, and right and left lateral excursions is necessary for the long-term clinical success of the implant complex.

The prescribed healing phase is 3 months in immediate extraction or edentulous ridge cases, and in sinus-grafted cases it is 4 to 5 months. At this time, if the

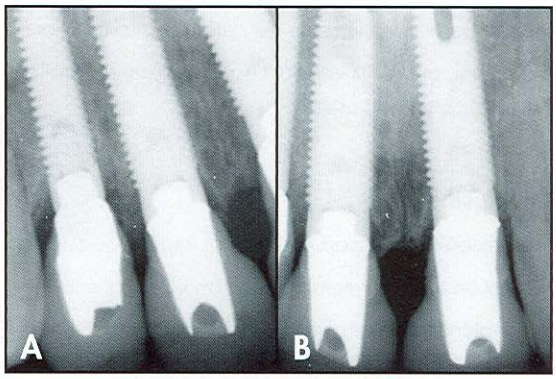

Figure 20A. Final radiograph of implant restorations on teeth #7 and #8. 20B. Three-month periapical radiograph of teeth #8 and #9.

restorative clinician chooses to use the stock abutment seated at the initial visit, the abutment is torqued to 30 Ncm, and the temporary is recemented. Routine restorative procedures are followed from that point.

Discussion

Implant treatment has previously been separated into the surgical phase and the restorative phase. Depending on the complexity of the planned site, the surgical phase may require two to four procedures in conventional implant treatment. The restorative phase, particularly in the aesthetic zone, may require tissue sculpting and provisionalization to achieve the foundation not only for aesthetics, but also for long-term restorative success. Over the years, conventional implant treatment has proven to be a highly successful treatment option for replacing the natural tooth system.

Advancements in surgical techniques, bone grafting materials, and bioengineering of the surgical site have allowed the implant surgeon to decrease treatment time and possibly surgical visits (Figures 8 through 15). Without proper communication among the surgeon, restorative dentist, and laboratory technician, however, the resulting poor or improper treatment planning will lead to complex and/or compromised prosthetic procedures. Continued advancements in surgical template designs and the incorporation of provisional restorations during implant placement have allowed the implant

team to better communicate the parameters for functional, biological, and aesthetic success in implant restorations (Figures 16 through 20).

Conclusion

The immediate restoration of dental implants is an exciting option that the implant team can offer patients seeking implant treatment. The incorporation of a provisional restoration during implant placement provides the patient with a stable, aesthetic temporary restoration. From a periodontal perspective, the author observes that the preservation of interdental bone, creation or maintenance of the soft tissue, and formation of a sound biologic width are all benefits of immediate restoration — in addition to decreasing patient treatment time. Using a nonincision approach in the aesthetic zone, with appropriate preoperative buccal tissue contours, is an effective method to maintain supportive interdental architecture in the papillary region, especially in cases with compromised interdental bone height and contours. Maintenance of the soft tissues, initially by not incising the area, and finally by placing a highly polished and appropriately contoured provisional restoration on the implant, is recommended in cases such as these in the aesthetic zone. The author recommends continued research and clinical studies on this procedure to supplement initial clinical reports presented in recent literature.

Acknowledgement

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CONTINUING EDUCATION (CE) EXERCISE NO. 6

To submit your CE Exercise answers, please use the answer sheet found within the CE Editorial Section of this issue and complete as follows: 1) Identify the article; 2) Place an X in the appropriate box for each question of each exercise; 3) Clip answer sheet from the page and mail it to the CE Department at Montage Media Corporation. For further instructions, please refer to the CE Editorial Section.

The 10 multiple-choice questions for this Continuing Education (CE) Exercise are based on the article, "Immediate restoration of implants utilizing a flapless approach to preserve interdental tissue contours," by Paul S. Petrungaro, DMD, MS. This article is on pages 151-158.

1. The implant of choice in an immediate restoration procedure should:
a. Be threaded in design.
b. Obliterate the apical portion of the socket.
c. Mimic the convergence of the natural tooth.
d. All of the above.

2. Surgical stent designs translate the:
a. Final restoration's dimensions.
b. Type of implant to be used.
c. Length of the healing phase.
d. Number of implants to be placed.

3. Antibiotics should be administered to the patient:
a. Preoperatively.
b. Intraoperatively.
c. The day after surgery.
d. No antibiotics are necessary in the protocol outlined.

4. A fixture-level impression at surgical placement of the implant is taken to:
a. Initiate evaluation of soft tissue contours.
b. Derive tissue-sculpting abutments.
c. Reduce patient treatment time.
d. All of the above.

5. The initial provisional abutment can be fabricated from:
a. The carrier mechanism.
b. Dedicated provisional abutment.
c. Stock abutment.
d. All of the above.

6. The ideal grafting material is:
a. Auteogenous bone.
b. Alloplastic bone.
c. Allogenic bone.
d. All of the above.

7. Platelet rich plasma is derived from:
a. Bovine blood.
b. Autologous blood.
c. A cell separator.
d. Both b and c.

8. The fabrication of the definitive implant restoration is routinely completed within a healing phase of:
a. 2 months.
b. 3 months.
c. 4 months.
d. 6 months.

9. For the long-term clinical success of the final restoration, occlusion should be:
a. Proper in centric relation, protrusive, and right and left lateral excursions.
b. A group function.
c. A canine function.
d. Possess no implant contact.

10. Advancements in surgical techniques, materials, and bioengineering of the surgical site have allowed the surgeon to:
a. Decrease treatment times.
b. Decrease surgical times.
c. Increase case acceptance.
d. All of the above.