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CHALLENGING
Clinical Situations in the Esthetic Zone:

Maintaining and Creating Natural Soft Tissue Contours and Emergence Profiles Around Dental Implants

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Abstract

The following article will demonstrate the immediate tooth removal process/implant placement/provisionalization procedure in a single tooth maxillary central incisor, and the procedure applied to a case requiring both maxillary central incisors being removed, and the immediate implant placement, provisionalization process performed. Both of these case types are traditionally considered to be challenging in regards to management of the diastema **(Case 1)**, followed by the replacement of both maxillary central incisors simultaneously **(Case 2)**.

Key Words: dental implants, provisionalization, surgical procedure, esthetic tissue profiles, minimally invasive

Introduction

Dental implant treatment continues to be a significant option in the treatment-planning process for tooth replacement procedures and is becoming commonplace in contemporary restorative and surgical dental practices. The more conventional, multi-step process of stage one and stage two surgical implant placement and attachment procedures, followed by an additional final prosthetic procedure, is the method taught at most university-based implant training programs and private continuing education learning programs. Additional procedures, often prior to stage one (implant placement procedure) require either bone replacement or soft tissue replacement procedures.[1-3] These multiple treatment phases utilizing dental implants for single or multiple tooth replacement could take anywhere from six to nine months of treatment, and in more complex cases, from 12 to 16 months of treatment, even for clinicians with extensive training.[1-3] Additionally, patients often were required to go without provisional restorations, or removable provisional restorations, throughout these lengthy healing phases.

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Immediate Implant Placement and Restoration Procedure

Over the last 10 years, the option of immediate tooth replacement and provisionalization (with or without occlusal loading) for the delivery of the implant process has gained presence in treatment plans for those requiring single or multiple implants.[4-6] This protocol differs from the more conventional multi-step approach of the implant placement process, with its three-to-six-month healing phase, a second surgical procedure (uncovering of the implant and healing abutment placement), and periodic observation of soft tissue maturation prior to the final restorative completion of the process. It simplifies that process into one procedure, wherein the implant is placed, and an abutment (either contoured final abutment, or a provisional abutment) and a provisional restoration are all accomplished at one single visit. Often, only a three-month healing and observation period is required. It is also important to note that most cases of immediate tooth removal and implant placement require some sort of bone replacement and tissue regeneration procedure, either as an entirely separate procedure, or in conjunction with the implant placement. In the more conventional multi-step approach, that may be managed as an entirely separate surgical procedure, hence expanding the entire treatment time; whereas in the immediate procedure of placement and provisionalization, whether tooth removal is required or not, the bone and tissue regeneration is routinely completed simultaneously with implant placement and provisionalization.

Additional Benefits

Additional benefits of the immediate implant placement and restoration procedure include the following:[7,8]

- less invasive, flapless approaches, often realized in the surgical procedure
- minimal soft tissue changes or loss due to less surgical procedures
- more predictable soft tissue emergence profiles for the final restoration, as the provisional restoration acts to sculpt and maintain papillary tissues and natural emergence profiles
- patients benefit from an immediate fixed provisional restoration
- decreased treatment times to complete the implant treatment process
- patients realize a quicker return to their normal day-to-day life.

Process Success

The process of immediate tooth replacement and provisionalization for single-tooth restorations has been well- documented in the dental literature.[4-12] The process in which a tooth is removed, the implant is placed (with or without bone or soft tissue replacement) by a minimally invasive means (flapless), a final abutment placed, and a well-contoured, highly esthetic provisional restoration seated, has been shown in the literature to be highly successful, with long-term success rates of 97.2% over an eight-year period in more than 3,200 sites.[7]

Multiple tooth replacement, following a similar protocol, has also been shown to be highly successful.[2]

Single and multiple tooth replacement, with immediate loading of the implants, following strict surgical and prosthetic principles,[13-15] and occlusal management, also has shown to be successful for those seeking dental implants as a tooth replacement option. As previously mentioned, these cases often require either bone or soft tissue replacement, or both, to replace the necessary surrounding environment for the implant to be successful long term,16 with these procedures being accomplished simultaneously with the initial, and only, surgical procedure.

Dental Implant Technology

Dental implant technology has continued to expand, with most implant systems offering enhanced surface technology for a more rapid integration process, thread designs leading to a greater initial stability of the implant fixture at placement, implant collar designs specific for alveolar crest of the ridge maintenance, and soft tissue seal in the implant/abutment interface, all leading to an implant process whereby bone and soft tissue preservation can be extremely predictable.[17-19] With initial stability quotient (ISQ) measurements and either machined, contoured titanium, or contoured stock zirconia abutments, the abutment removal process, prior to final restorative protocols, can be totally eliminated, thus protecting the soft tissue attachment apparatus of the gingival tissue and the implant/abutment complex, helping to maintain bone level long term around dental implants.

All of these advances contribute to the rationale for a more immediate, one-stage protocol for implant placement, and provisionalization/loading procedure.

Figure 1: Pretreatment clinical view, Case 1.

Figure 2: Pretreatment digital periapical view, left central incisor.

Case 1

A 33-year-old, nonsmoking male presented for treatment of an endodontically failing maxillary left central incisor **(Fig 1)**. The patient had previously experienced facial trauma, which caused partial avulsion to both maxillary central incisors, resulting in devitalization and, subsequently, the root canal treatment. The left maxillary central had undergone external resorption resulting in the necessity for removal **(Fig 2)**, and an implant was planned for the tooth replacement. After reviewing multiple alternatives for implant placement procedures, the patient selected the option of immediate tooth removal, implant placement, and immediate provisional. The patient's medical history was noncontributory and, after a complete dental examination was performed, maxillary and mandibular study models were obtained, along with a facebow transfer. A diagnostic wax-up was then completed for the right and left central incisors, followed by the fabrication of a surgical guide/provisional system (TempStent II, Dr. Paul Petrungaro; Chicago, IL) 20 to facilitate the conversion of the surgical guide to immediate provisional at the implant placement procedure **(Fig 3)**.

Prior to the implant placement surgical procedure, the patient was placed on Augmentin (GlaxoSmith-Kline; Philadelphia, PA): 20 tablets, one tablet every 12 hours, and was instructed to start the antibiotic the day before the procedure, and one tablet, one hour before the procedure.

An incisal edge index of the maxillary anterior sextant was obtained before surgery, to register the preoperative spatial arrangement of the maxillary left central incisor. After administration of an appropriate local anesthetic, the maxillary left central incisor was removed by an atraumatic technique, preserving the natural emergence profile of the surrounding gingival

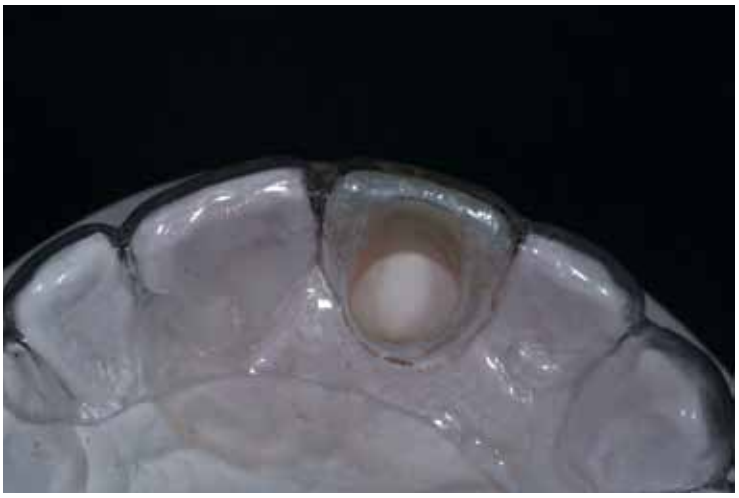

Figure 3: TempStent II surgical guide, occlusal view.

Figure 4: Occlusal view, TempStent II, intraorally.

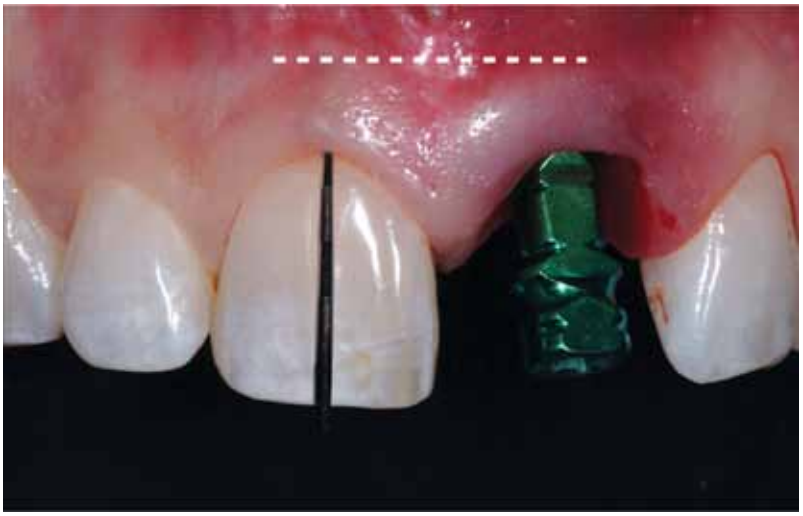

Figure 5: Proper depth of implant placement, left central incisor.

tissues. Debridement of the extraction socket was completed by mechanical curettage with a small molt curette, and rotary instrumentation with a coarse diamond on a high-speed handpiece and saline irrigation. All remnants of the periodontal ligament and/or granulation tissue were thoroughly removed, to prevent the possibility of soft tissue in apposition to the implant surface, hindering the bone-implant interface at the initial healing phase, resulting in non-integration. Once debridement was completed, the TempStent II surgical guide was inserted **(Fig 4)** and site preparation completed. A 3.7 x 13-mm implant (Zimmer Dental; Carlsbad, CA) was placed at the palatal aspect of the extraction socket, with the depth of the implant placement dictated by the facial height of contour of the bone at the contralateral right central incisor **(Fig 5)**.[21] Removal of the implant carrier was followed by placement of the healing screw, followed by placement of an allogenic, mineralized cancellous graft, 1- to 2-mm particle size (Exactech; Alachua, FL), heavily condensed into the peri-implant defect on the facial of the implant; this was fixed to the facial aspect of the implant to fill the void up to the fenestration present in the buccal plate **(Fig 6)**. Removal of the healing screw was followed by placement of a stock contoured titanium abutment, 341S (Zimmer), and the center screw hand tightened. A plastic provisional coping was roughened and bonding agent applied; it then was picked up in the natural tooth shell that had been altered and hollowed out previously. The natural tooth shell was lined with a regular composite and placed back into the incisal edge index obtained before surgery. The entire complex was then placed over the provisional coping, which was seated on the contoured abutment, and the tooth shell/composite complex was cured with a curing light. This registered the pre-surgical spatial arrangement of the left central exactly over the implant/abutment complex placed in the fresh extraction socket.

Figure 6: Peri-implant bone grafting.

Figure 7: Immediate postoperative clinical view, Case 1.

Figure 8: Two and a half months postoperative, Case 1, lateral view.

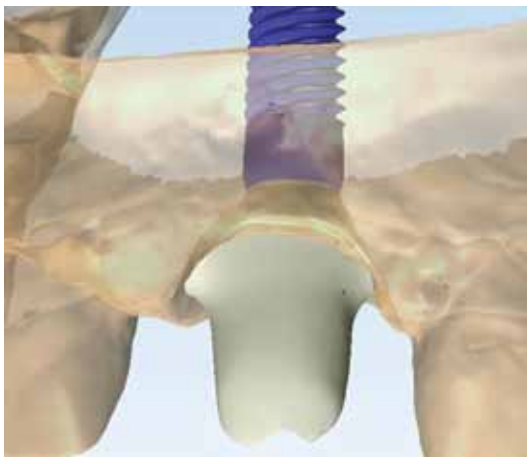

Figure 9: CAD/CAM designed milled zirconia abutment.

Figure 10: Final milled zirconia abutment, all-ceramic restoration, Case 1.

Figure 11: Clinical view, 10 days after seating.

Figure 12: Digital periapical view, Case 1; case complete.

The natural tooth shell provisional complex was then removed from the mouth, and the margins of the provisional restoration were completed to the provisional coping with a flowable composite, with the provisional properly contoured and polished. The provisional was then temporarily cemented with clear TempBond (Kerr, Orange, CA), and the cement again light-cured. The immediate postoperative clinical appearance is shown in **Figure 7**. Please note how the contouring of the medial and distal line angle relationships offers passive support to the preexisting soft tissue emergence profiles.

The patient was then evaluated for occlusal contact in the centric, protrusive, and lateral excursive movements to ensure that no contact was present at the implant site, as this was an immediate nonfunctional load.

After two and a half months, impressions for a custom-milled zirconia abutment were completed. Figure 8 shows the natural soft tissue emergence profiles that had been maintained and sculpted for the immediate provisionalization procedure at the implant placement visit. Following fixture level impressioning, the resultant model was sent for design of the milled zirconia abutment **(Fig 9)**.

Three months after surgery, the implant process was completed. Placement of the milled zirconia abutment and torqueing of the center screw to 30Ncm **(Fig 10)** preceded placement of the final all ceramic restoration. The 10-day post-seating clinical view is shown in Figure 11, with the case complete periapical radiograph shown in **Figure 12**. A six-month post-seating lateral view **(Fig 13)** demonstrates the natural appearance of the emergence profile obtained for this procedure.

Figure 13: Six month post-treatment clinical view, lateral emergence profile.

One of the most challenging issues facing the implant team is maintaining and/or sculpting soft tissue contours throughout the dental implant process in the esthetic zone.

Figure 14: Pretreatment clinical view, Case 2.

Case 2

A 47-year-old nonsmoking male presented for treatment of failing dentition at the maxillary right and left central incisors **(Figs 14 & 15)**. Previous treatment included root canal therapy as a result of trauma to the incisors, with prior full-coverage restorations that had failed, with a vertical fracture present at the left central incisor. The present state of the centrals necessitated crown lengthening to be performed to determine the depth of fracture at the left central incisor, which would compromise the esthetic result to be obtained. The decision was made to proceed with implant therapy at both maxillary central incisors and to accomplish definitive treatment for the compromised situation present.

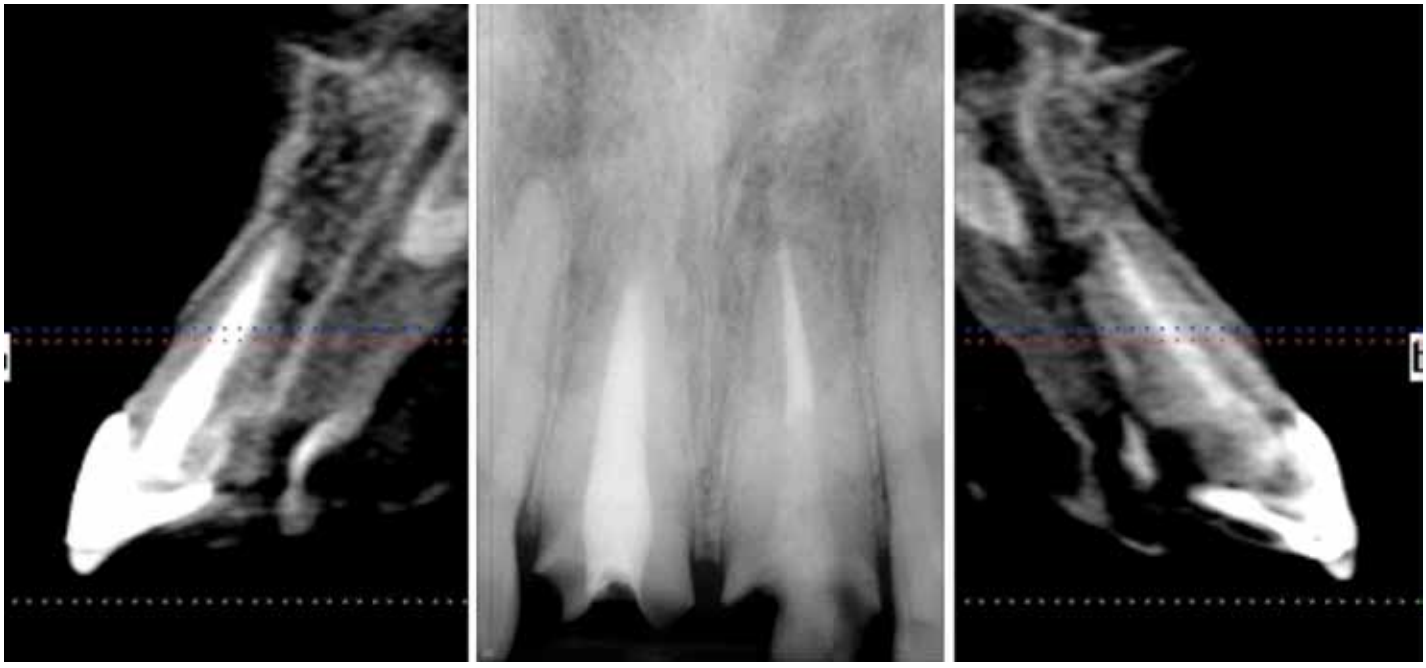

Figure 15: Pretreatment digital periapical radiograph, Case 2, and CT scan serial views of the right and left maxillary central incisors.

Figure 16: Traumatic tooth removal.

Figure 17: Implant placement, central incisors, minimally invasive placement.

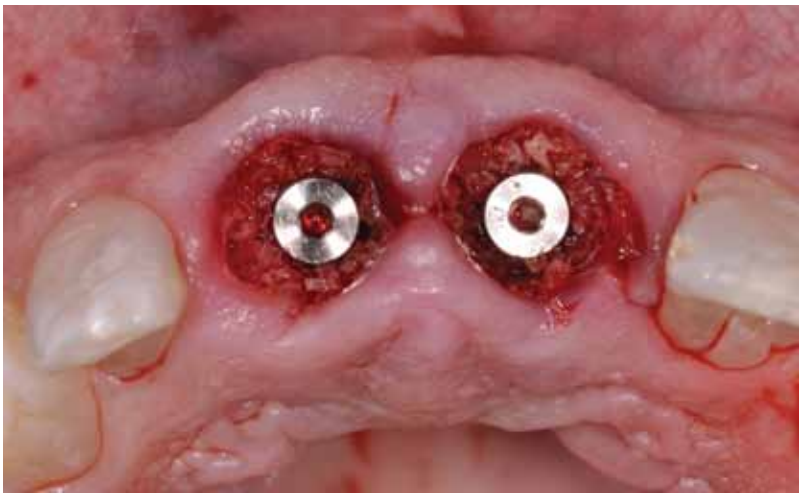

Figure 18: Minimally invasive bone grafting, peri-implant defects.

After maxillary and mandibular study models and a facebow transfer were obtained, a diagnostic waxing of the maxillary anterior sextant was performed. A surgical guide was then fabricated. The patient had decided to concentrate on only the maxillary central incisors, declining esthetic enhancement of the surrounding dentition.

After administration of an appropriate local anesthetic, the maxillary central incisors were removed atraumatically, preserving the pre-existing gingival emergence profiles **(Fig 16)**. Following debridement of the extraction sockets, ensuring that all remnants of the periodontal ligament and any granulation tissue were removed, the surgical guide was inserted and initial coring procedures were accomplished. After appropriate site preparation, two 3.7-mm diameter by 13-mm length implants (Zimmer Dental) were placed to the appropriate depth within the extraction sockets **(Fig 17)**. A sufficient initial ISQ measurement was obtained, allowing for immediate provisionalization of the implants. Prior to abutment placement, the peri-implant alveolar defects (fenestration type defect) required correction. An allogenic, mineralized cancellous bone graft, 1- to 2 mm in particle size (RTI Biologics, Alachua, FL) was placed and heavily condensed into the peri-implant defect at the facial of the implants **(Fig 18)**. Stock titanium abutments were then seated over the implants placed, and retrofitting of the TempStent II surgical guide was accomplished. The nonfunctional provisional restoration was then properly contoured, highly polished, and temporarily cemented with strong temporary cement. The immediate postoperative clinical view is shown in **Figure 19**. A seven-day postoperative view is shown in **Figure 20**; please observe the maturity level of the soft tissue emergence profile so soon after surgery. The patient had a three-month healing and observation period for integration of the implants to occur. A fixture-level impression was then obtained prior to final seating of the milled zirconia abutments fabricated in this case. **Figure 20** demonstrates the soft tissue emergence profiles that were sculpted and maintained throughout the healing phase, by the properly contoured provisionals fabricated at placement. **Figure 21** shows the natural soft tissue emergence profiles obtained prior to fixture-level impressioning. **Figure 22** shows the final implant-supported restorations obtained. The case complete digital periapical radiograph is shown in **Figure 23**, and the CT scan serial views of the implants are shown in **Figs 24 & 25**.

Figure 19: Immediate postoperative clinical view.

Figure 20: Seven-day postoperative clinical view.

Figure 22: Case complete clinical view, Case 2.

Conclusion

One of the most challenging issues facing the implant team is maintaining and/or sculpting soft tissue contours throughout the dental implant process in the esthetic zone. Additionally, the replacement of compromised alveolar contours is one of the key determining factors to the long-term stability of soft tissue contours that compromise the natural emergence profile of the implant-supported esthetic restoration. Numerous surgical procedures have been clinically observed to affect not only the quality, but also the quantity of soft tissue contours around dental implants in the esthetic zone. This is even more exemplified in challenging clinical situations of multiple implants, adjacent to one another in the esthetic zone, and single-teeth implants where compromised alveolar contours are present, and natural spacing exists between central incisors. Provisionalization of dental implants at placement, following minimally invasive surgical protocols and properly contoured esthetic provisionals, has been shown in the dental literature to aid in the sculpting and preservation of esthetic soft tissue contours around dental implants in the esthetic zone.[4-12] Additionally, following this immediate restoration protocol, as the implant matures and integrates in the three-month healing phase, along with the bone replacements graft, the esthetic soft tissue emergence profile also has this time frame maturation. This can result in stable, contoured esthetic soft tissue profiles, which allow the final implant-supported restoration to be fabricated following the natural soft tissue emergence profile maintained or sculpted at the initial tooth removal and implant placement process. The author has observed this procedure to provide esthetic soft tissue contours around dental implants in the esthetic zone.

References

1. Adell R, Lekholm U, Rockler B, Brånemark PI. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg. 1981 Dec;10(6):387-416.

2. Adell R, Eriksson B, Lekholm U, Brånemark PI, Jemt T. Long-term follow-up study of osseointegrated implants in the treatment of totally edentulous jaws. Int J Oral Maxillofac Implants. 1990 Winter;5(4):347-59.

3. Babbush CA, editor. Dental implants: the art and science. 2nd ed. Philadelphia: W.B. Saunders; 2001. p. 201-16.

4. Wörhle PS. Single-tooth replacement in the aesthetic zone with immediate provisionalization: fourteen consecutive case reports. Pract Periodontics Aesthet Dent. 1998 Nov-Dec;10(9):07-1114; quiz 1116.

5. Kan JY, Rungcharassaeng K. Immediate placement and provisionalization of maxillary anterior single implants: a surgical and prosthetic rationale. Pract Periodontics Aesthet Dent. 2000 Nov-Dec;12(9):817-24; quiz 826.

6. Petrungaro PS. Implant placement and provisionalization in extraction, edentulous, and sinus grafted sites: a clinical report on 1500 sites. Compend Contin Educ Dent. 2005 Dec;26(12):879-90.

7. Petrungaro PS. Immediate implant placement and provisionalization in edentulous, extraction, and sinus grafted sites. Compend Contin Educ Dent. 2003 Feb;24(2):95-113.

8. Saadoun AP, Le Gall MG. Periodontal implications in implant treatment planning for aesthetic results. Pract Perio Aesthet Dent. 1998;10:655-64.

9. Petrungaro PS. Creation and preservation of natural soft tissue emergence profiles around dental implants in the esthetic zone. J Cos Dent. 2009 Winter;24(4):66-80.

10. Saadoun AP. Immediate implant placement and temporization in extraction and healing sites. Compend Contin Educ Dent. 2002 Apr;23(4):309-326.

11. Petrungaro PS. Immediate restoration of dental implants in conjunction with maxillary sinus elevation procedures: an initial report of 77 implant sites. Int Mag Oral Implantology. 2002;4(3):6-16.

12. Petrungaro PS. Immediate restoration of dental implants in the aesthetic zone. Dent Implantol Update. 2001;12(12)89-95.

13. Tarnow DP, Magne AW, Fletcher P. The effect from the distance from the contact point to the crest of one on the presence or absence of interproximal dental papillae. J Periodontol. 1992;53(12):995-6.

14. Tarnow DP, Cho SC, Wallace S. The effect of inter-implant distance on the height of the inter-implant bone crest. J Periodontol. 2000;71(4):546-9.

15. Salama H, Salama MA, Garber D, Adar P. The interproximal height of bone: the guidepost to predictable aesthetic strategies and soft tissue contours in anterior tooth replacement. Pract Perio Aesthet Dent. 1998;10(9):1131-41.

Figure 21: Natural, esthetic, soft tissue emergence profiles obtained prior to fixture-level impression.

Figure 23: Case complete peri-optical digital radiograph, maxillary central incisor.

16. Kois JC. Predictable single-tooth peri-implant esthetics: five diagnostic keys. Compend Contin Educ Dent. 2004;25(11):895-905.

17. Brunski JB. Biomaterials and biomechanics in dental implant design. Int J Oral Maxillofac Implants. 1988 Summer;3(2):85-97.

18. Fischer K, Backstrom M, Sennerby L. Immediate and early loading of oxidized tapered implants in the partially edentulous maxilla: a 1-year prospective, clinical radiographic, and resonance frequency analysis study. Clin Implant Dent Relat Res. 2009 Jun;11(2):69-80.

19. Neugebauer J, Weinlander M, Lekovic V, von Berg KH, Zoeller JE. Mechanical stability of immediately loaded implants with carious surfaces and designs: a pilot study in dogs. Int J Oral Maxillofac Implants. 2009 Nov-Dec;24(6):1083-92.

20. Petrungaro PS. Using the TempStent technique to simplify surgical stent and esthetic temporary fabrication in immediately restored implants in the aesthetic zone. Contemp Esthet Rest Pract. 2002;6(5)84-90.

21. Petrungaro PS. Immediate restoration of dental implants in the aesthetic zone utilizing a flapless approach to preserve interdental tissue contours. Pract Proced Aesth Dent. 2005 Mar;17(2):151-8. **jCD**

Figure 24: Case complete CT scan, serial view, right central incisor, left central incisor.

Figure 25: Case complete CT scan, serial view, left central incisor.

Dr. Petrungaro is the founder of The Implant Learning Center, in Chicago, Illinois. He has a private practice in Chicago.

Disclosure: Dr. Petrungaro is a surgical consultant and speaker for Zimmer Dental. He is the developer of the TempStent II surgical guide discussed in this article.

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