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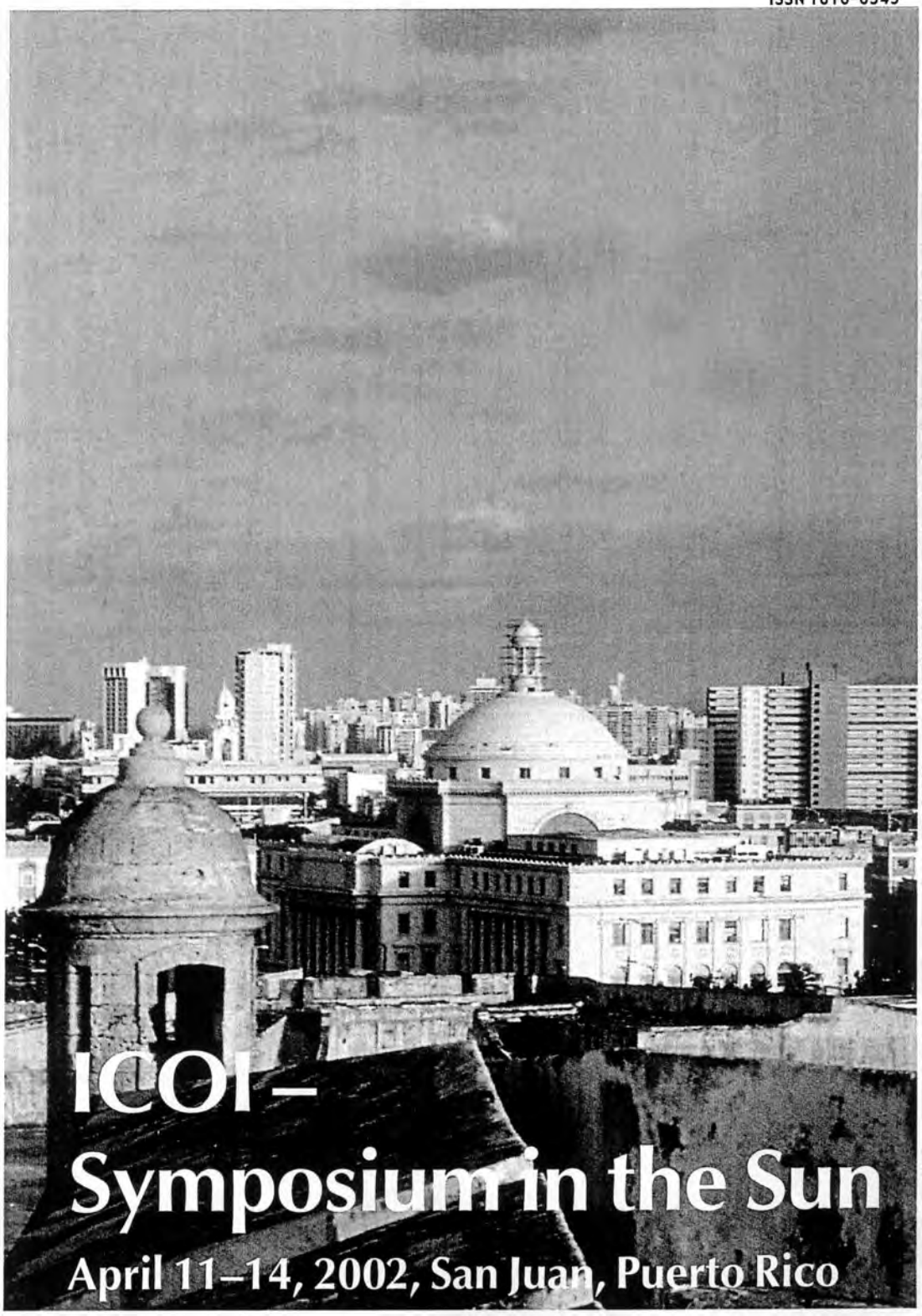

Immediate Extraction/Implant Placement: Healing Phase Management with Platelet Rich Plasma and Transitional Implants

PAUL S. PETRUNGARO, DDS, MS, FACD, FICD/USA*

The evolution of the implant-supported rehabilitation of the edentulous patient is well documented in the dental literature.[1–4] As has been extensively described, surgically and restoratively, the submerged implants are usually placed in a two stage surgical sequence. At the initial procedure the implants are placed, and the cover screws are seated. The implants and surrounding tissues are allowed to mature and integrate over a four to six month healing phase. At the second-stage surgery, the implant fixture is exposed, and a variety of healing or permanent abutments are seated. The restorative clinician then initiates techniques that result in the fabrication of the definitive prosthesis.

In the early development of implant technology, the lack of quality and volume of bone in the maxillary and mandibular arches often preceded implant therapy. As technologies evolved, so did surgical techniques aimed at augmenting bone and soft tissue contours to a level to receive dental implants in an adequate environment.[5–10]

Initially, and with the development of the new technologies to replace bone, patients were often instructed to refrain from the use of their full or partial dentures for 7 to 14 days after the initial surgical visit. This usually impeded potential patients from initiating implant-related bone grafting procedures. In addition, in the past, extended healing phases were used to avoid premature pressure being placed on the newly implanted or bone grafted ridge. Exfoliation of the graft particles or barrier membranes, or implant themselves, caused failure of the surgical procedures and delayed case completion, not to mention patient dissatisfaction.

A major focus in implantology has become the patient's comfort and aesthetics throughout their healing phases and with their final restorations.[11–13] Over the past 5 to 6 years, clinicians have been able to address the need for an undisturbed healing of the surgical site during the integration phase. In addition, patients can immediately enjoy the benefits of implant dentistry by having stable and functional temporaries. Patients can now function immediately while allowing the surgical site to heal without pressure from a prosthesis.[11–13]

A stable and functional temporary prosthesis can be made using transitional implants. Transitional implants have been clinically proven to allow for an uninterrupted healing phase for the implant reconstructed and/or bone grafted ridge, and allow patients that are edentulous, or are undergoing tooth removal to immediately enjoy the benefits of implant dentistry. In addition, they allow the implant team to develop initial prosthetic relationships throughout the healing phase, while maintaining a constant vertical dimension.[14]

A more recent development in the healing phase management of patient's undergoing extensive implant and/or bone grafting procedures has been the incorporation of Platelet Rich Plasma (autologous platelet gel) into the surgical armamentarium to enhance the healing and maturation rate of the bone grafted/regenerated and/or implant reconstructed ridge by locally delivering growth factors to the surgical site.[15,16]

- Transforming Growth Factor-beta (TGF-β)
- Platelet-Derived Endothelial Cell Growth Factor (PDECGF)
- Platelet-Derived Angiogenesis Factor (PDAF)
- Insulin-like Growth Factor (IGF)
- Platelet-Derived Growth Factor (PDGF)
- Vascular Endothelial Cell Growth Factor (VEGF)

The following is a summary list of the growth factors found in Platelet Rich Plasma:[15–16]

Platelet Rich Plasma is derived from 55 cc of whole blood obtained by venous puncture. After procurement of the whole blood, a centrifugation process by a dual spin centrifuge (Smart PreP®, Harvest Technologies, Plymouth, Ma) separates out the plasma containing the platelet concentrate (plug) from the whole blood and by further manually separating the plasma containing the platelet concentrate (Platelet Rich Plasma) from the plasma immediately above the rich plasma, the Platelet Poor Plasma, provides two platelet concentrates that can be used by the implant surgeon in a wide variety of applications.

Using Platelet Rich Plasma enhances the maturation and uptake rate for bone grafts and tissue regeneration in dental surgical procedures, and has been observed clinically to allow the implant team to place the final

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Platelet Rich Plasma Use in Implant/ Bone Grafting Surgery[17,18]

- Bone grafting Adjunet to reconstruct an atrophic ridge
- Ridge preservation techniques
- Acceleration of hard-tissue maturation and block graft procedures
- Regeneration of peri-implant defects
- Coating of the implant surfaces before placement to aid in the initial stabilization and bonding of the implant to the alveolar bone
- Sinus graft procedures
- Immediate extraction and implant placement procedures
- Immediate extraction, implant placement, and immediate restoration procedures
- Treatment of failing implants

load on the definitive implant fixtures sooner than had been previously recommended.[17,18]

Treating the advanced periodontal disease patient requiring tooth removal and immediate implant placement requires a detailed surgical protocol.[19-22] Managing the healing phase by providing the patient with a stable transitional prosthesis, and enhancing the wound healing process by allowing the bone grafted and/or implant reconstructed ridge to regenerate at a more rapid rate by delivering growth factors locally to the bone graft and implant surface, has allowed the author to complete implant reconstructions after tooth removal in as soon as four months, with the patients never being without teeth and maintaining a constant vertical dimension.

The following case reports demonstrate the use of transitional implants in patients undergoing immediate tooth removal followed by implant placement, and allow for a comparison to be made between the use of Platelet Rich Plasma (PRP) to enhance the wound healing process (case 2), and a more conventional case management (case 1). The enhanced wound healing process demonstrated in case 2 allows the patient to proceed to the final implant supported restoration three months after tooth removal and immediate implant placement, whereas in case 1, without PRP, the final successful result was achieved after a six month healing and maturation phase. Platelet Rich Plasma (PRP) is used for the reconstitution of allogenic and/or alloplastic bone grafts, as a regenerative barrier. It can be used as a growth factor impregnated surgical dressing to enhance wound healing. Its uses has allowed the patient's healing phase to be one that causes minimal changes to their everyday life along with allowing them to complete their implant treatment sooner. In addition it has been suggested that its use may reduce the incidence of non-integration at the stage II procedure in cases where periodontically affected teeth were immediately replaced with implants.

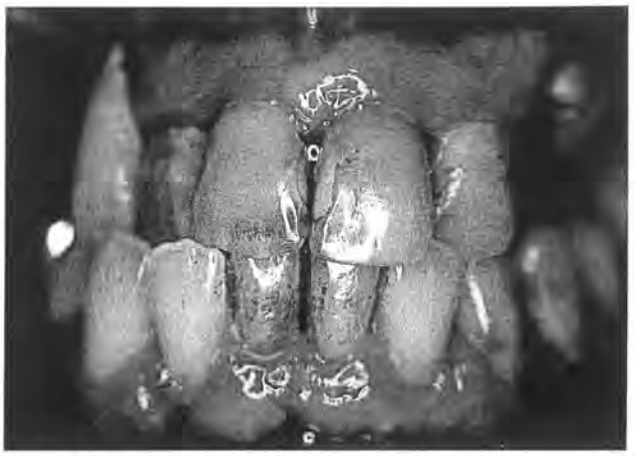

FIGURE 1 *Pre-operative clinical view.*

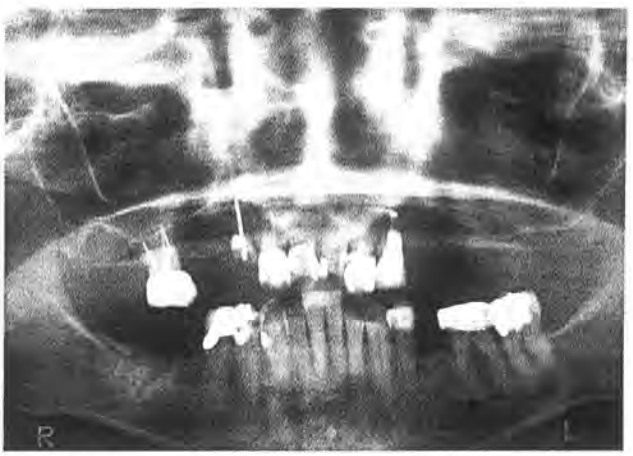

FIGURE 2 *Pre-operative panoramic radiograph.*

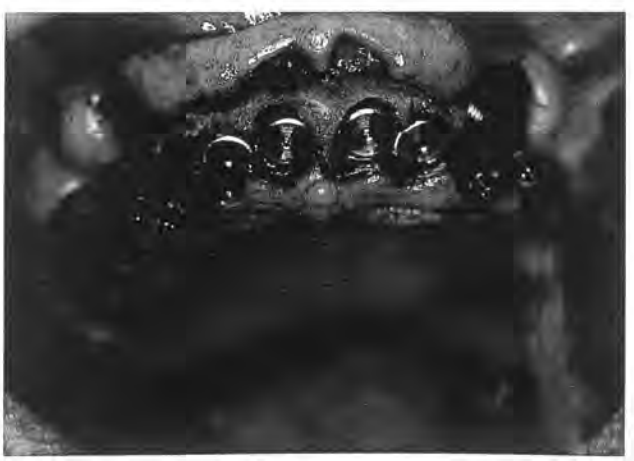

FIGURE 3 *Clinical view of the permanent implants, with the transitional implants placed interstitially.*

Case 1

A 52-year-old smoking female with generalized mild to moderate periodontal disease presented for dental rehabilitation (Figs. 1, 2). After a comprehensive treatment planning phase that consisted of a thorough medical and dental evaluation, mounted study casts, and completion of the Master Diagnostic Model® technique (Valley Dental Arts, Stillwater, MN) for diagnostic wax-

ing of both the hard and soft tissues that needed to be altered/replaced, the decision to remove all maxillary teeth, and replace them immediately with dental implants was made. To aid in the healing phase management, the MTI Transitional Implant System (Dentatus, USA, New York, NY) would be incorporated into the surgical protocol to support a chairside fabricated acrylic temporary derived from the MDM®.

After administration of an appropriate anesthetic, all maxillary teeth were atraumatically extracted, and the housings of the extraction sockets thoroughly debrided of all granulation tissue and remnants of remaining periodontal ligament. After insertion of the surgical guide generated from the Master Diagnostic Model®, six sites were prepared, followed by the placement of six SteriOss Replace implants (NobelBiocare, Yorba Linda, CA). Following implant placement, additional sites were selected for the interstitial placement of eight MTI Transitional implants, and at the right and left distal aspects of the surgical site (Fig. 3).

Periimplant grafting was completed using Demineralized Freeze Dried bone reconstituted with sterile saline, and an absorbable regenerative barrier, (Biomend, Sulzer Dental, Inc. Carlsbad, CA) to prevent epithelial migration into the graft/implant site (Fig. 4). Suturing was completed by a combination of horizontal and vertical mattress suturing techniques with 5.0 Monocryl suture (Ethicon, Inc., Sommerville, NJ).

Fabrication of the temporary was accomplished with cold cure acrylic. After occlusal correction, the MTI transitional implant supported temporary was cemented with a temporary cement, and the patient dismissed. A six-month post implant placement clinical view of the chairside fabricated MTI supported temporary prosthesis can be seen in Fig. 5.

At the completion of the Stage II procedure, the transitional implants were removed in a counter-clockwise fashion, and temporary abutments prepared and seated. The original temporary was then retrofitted over the temporary abutments, which allows the restorative dentist to easily remove the prosthesis for the required impression techniques, related prosthetic procedures and delivery of the final implant supported restoration (Figs. 5, 6).

On the final panoramic x-ray, the remains of a transitional implant that had fractured in the healing phase remains at the mesial/apical aspect of the left posterior implant. It is the opinion of the author that in this instance, where retrieval presents a significant risk to the adjacent implant, host bone, or other relevant anatomic landmarks to leave the pure titanium post integrated as no damage will result from its being there. The final resto-

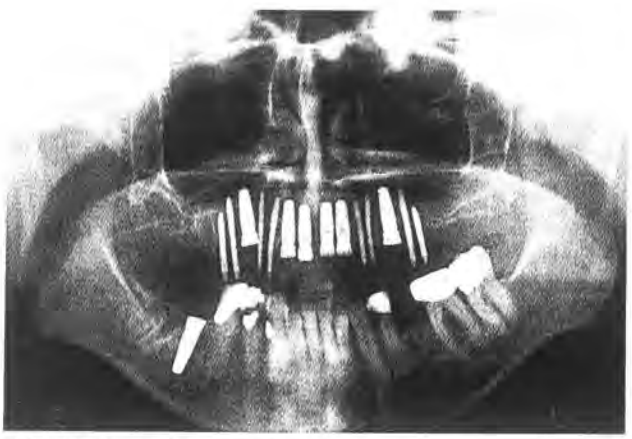

FIGURE 4 *Immediate post-operative panoramic x-ray.*

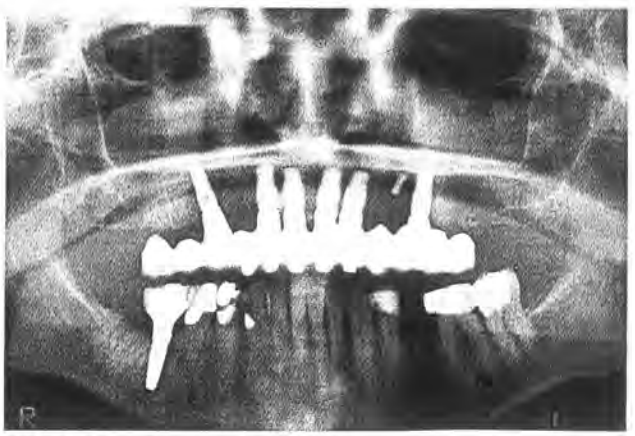

FIGURE 6 *Final panoramic radiograph.*

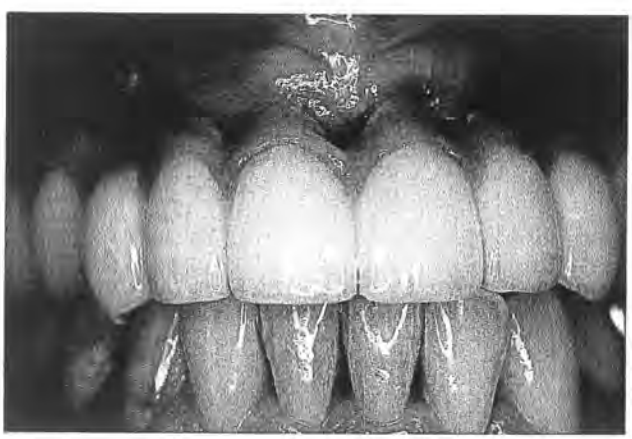

FIGURE 5 *Final implant supported restoration.*

FIGURE 7 *Immediate extractions, and placement of six endosteal implants, and five transitional implants placed interstitially in the mandibular arch.*

rative result was obtained in a total treatment phase lasting eight months.

Case 2

A 56-year-old smoking male presented for consultation regarding advanced periodontal disease and dental decay. After comprehensive dental evaluation and a complete diagnostic waxing procedure which consisted of the Master Diagnostic Model® technique, the patient was presented options for salvaging some teeth or removal of all teeth and reconstruction with dental implants. The patient opted for the immediate extraction technique with immediate placement of eight implants in the maxillary arch and six implants in the mandibular arch. Utilization of PRP to accelerate hard and soft tissue maturation was incorporated, and transitional

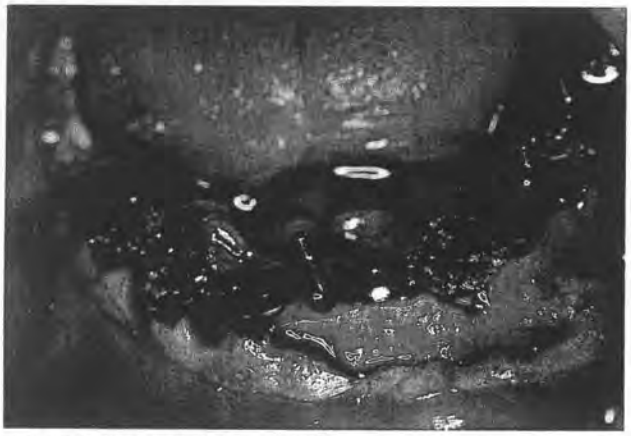

FIGURE 8 *Platelet Rich Plasma (PRP)/graft complex placed around the peri-implant defects, and remaining extraction sockets with PRP followed by Platelet Poor Plasma (PPP) over the surgical site.*

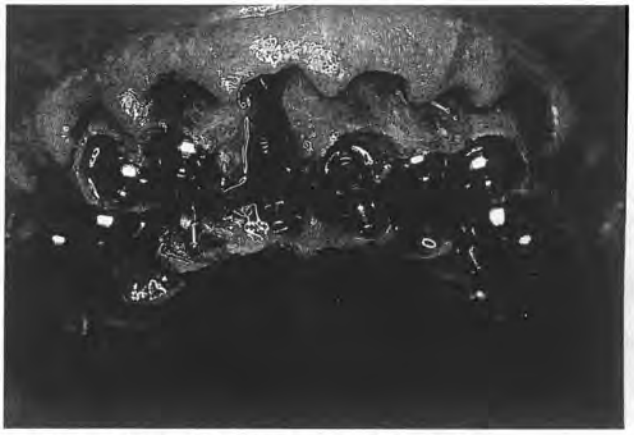

FIGURE 11 *Six transitional implants are also inserted.*

FIGURE 9 *Soft-tissue closure of the mandibular arch with PRP followed by PPP over the wound site.*

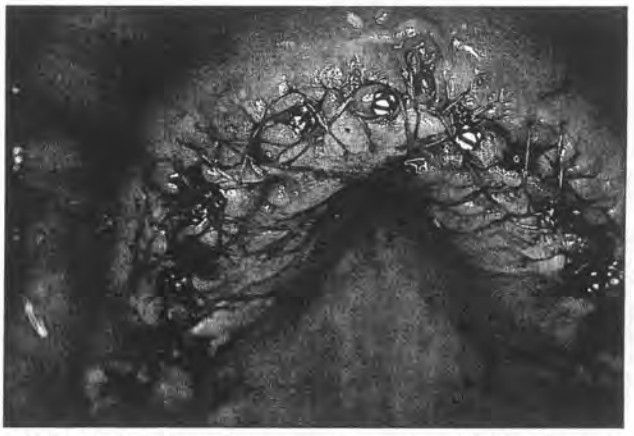

FIGURE 12 *Soft tissue closure, maxillary arch, exhibiting the transitional implants posts.*

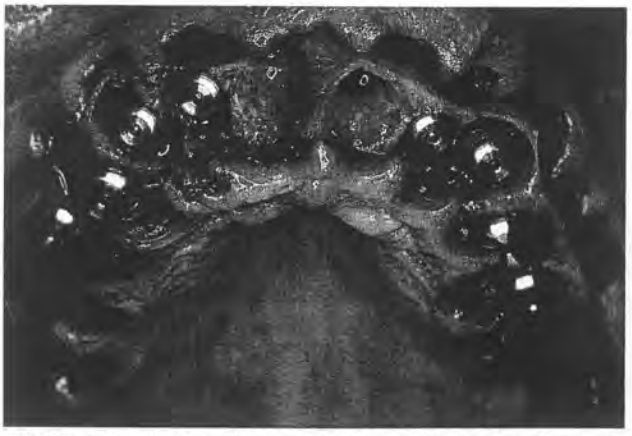

FIGURE 10 *Maxillary teeth are extracted, and eight endosteal implants are inserted with immediate placement within the housings of the extraction sockets.*

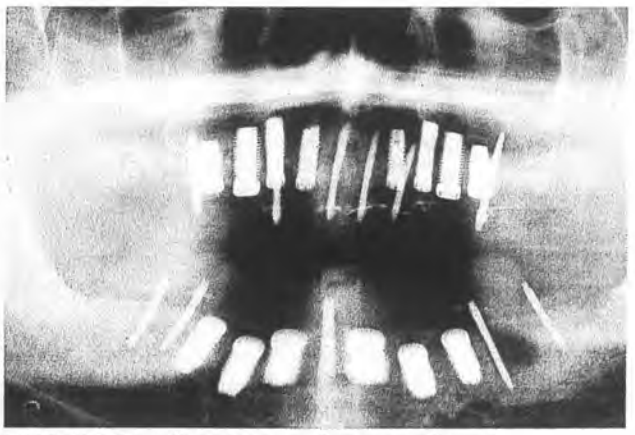

FIGURE 13 *Immediate post-operative panoramic x-ray.*

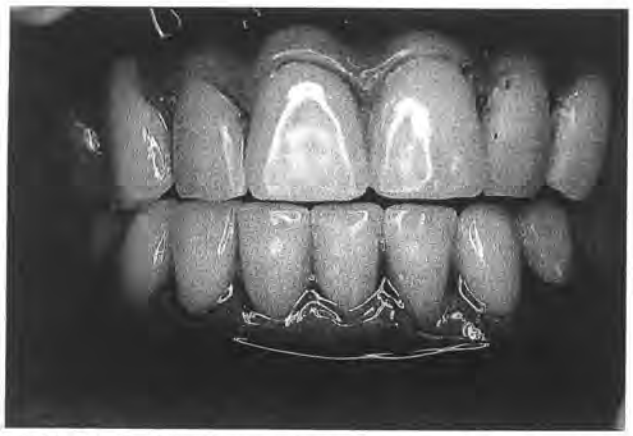

FIGURE 14 *Provisional restorations, transitional implant supported maxillary and mandibular arches.*

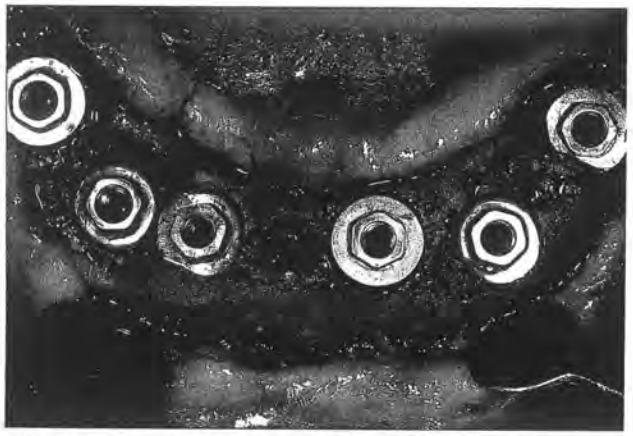

FIGURE 15 *Three-month re-entry and transitional implant removal, mandibular arch.*

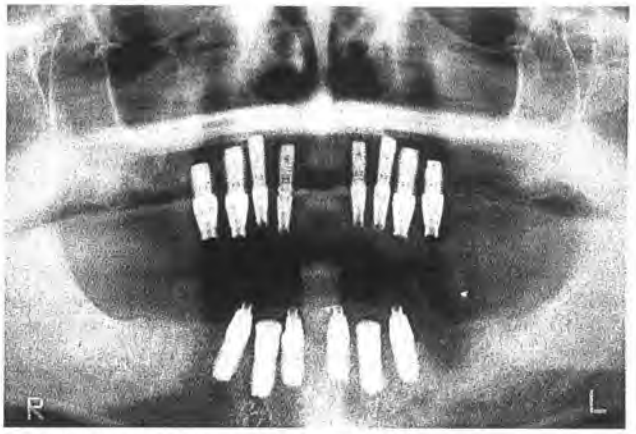

FIGURE 16 *Immediate post Stage II panoramic radiograph, three months after tooth removal and implant placement.*

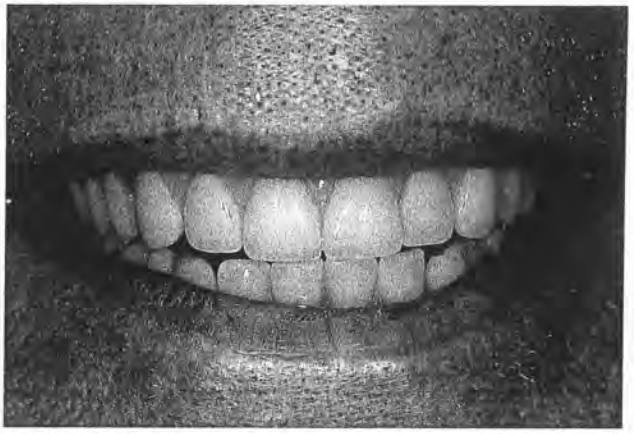

FIGURE 17 *Final post operative view.*

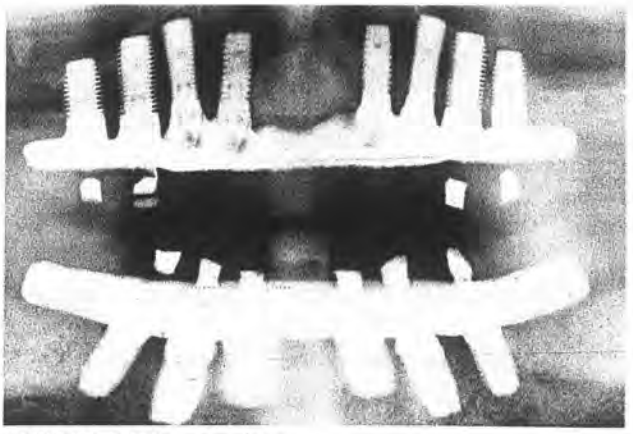

FIGURE 18 *Final panoramic x-ray.*

implants utilized to support the temporary prosthesis. After administration of an appropriate local anesthetic throughout the maxillary and mandibular arches, the mandibular arch was treated first by removal of all teeth, degranulation of the extraction sockets, and followed by the placement of six endosteal implants, (Biohorizons, Birmingham, Alabama) four D2, 5 mm in diameter by 10 mm in length, and two D3, 5 mm diameter in by 11 mm in length). After placement of the implants, five MTI transitional implants, were placed interstitially between the permanent fixtures (Fig. 7). The combination PRP/graft complex, using Pepgen P-15 (Ceramed Dental, LLC, Lakewood, CO) as the graft substrate was then inserted into the housings of the extraction socket and around the peri-implant defects (Fig. 8). Application of Platelet Rich Plasma (PRP) initially, followed by application of Platelet Poor Plasma (PPP) acting as a growth factor impregnated biologic barrier acted to inhibit soft tissue ingrowth of the graft in addition to stimulating osseous and soft tissue maturation and differentiation. Soft tissue closure was accomplished by continuous sling and horizontal mattress suturing techniques with 5.0 Monocryl suture (Ethicon, Inc., Sommerville, NJ). Application of PRP followed by PPP over the surgical site was used to act as a growth factor impregnated surgical dressing (Fig. 9).

The focus of the surgery then shifted to the maxillary arch. After tooth extraction and thorough debridement eight Biohorizons implants were placed, two D4, 5 mm in diameter by 9 mm in length, two D4, 5 mm in diameter by 12 mm in length, two D4, 4mm in diameter by 13 mm in length and two D2, 4 mm in diameter by 11 mm in length within the housings of the eight extraction sockets (Fig. 10). Transitional implants were placed interstitially between the permanent implants, and a layer of PRP applied over the surgical site, prior to grafting (Fig. 11). Regeneration of the osseous and peri-im-

plant defects was accomplished with the PRP/graft complex, PRP was applied initially, followed by PPP over the surgical site to act as a growth factor impregnated biological barrier. Soft-tissue closure was accomplished with 5.0 Monocryl suture by a continuous sling and horizontal mattress suturing technique (Figs. 12, 13). Additional PRP followed by PPP was once again applied over the surgical area to act as a growth factor impregnated wound dressing prior to temporary construction. Using the pre-fabricated denture setups constructed by the laboratory, from the completed MDM®, transitional dentures were retrofitted to the heads of the transitional implants, and cemented with a temporary cement (Fig. 14). PRP, followed by PPP was then applied over the temporaries and surgical sites to act as the final surgical dressing.

After a the three-month healing phase the temporaries in the maxillary and mandibular arches were removed. The transitional implants in the maxillary and mandibular arch were deposed by counter-clockwise rotation, and conservative crestal incisions in the maxillary and mandibular arches, exposed the implants. The bone regeneration of the bone around the implants can be readily observed (Fig. 15). The final implant supported restorations were delivered 4 months after the beginning of treatment (tooth removal and implant placement) (Figs. 17, 18).

Conclusion

Incorporation of transitional implants into the more extensive implant surgical and restorative treatment plan allows the patient to have a more pleasant and stable healing phase after tooth removal. The Vertical Dimension of Occlusion my be maintained, in addition to continued support of the facial structures, all the while allowing the surgical site to heal without external pressure from a prosthesis.

Utilization of Platelet Rich Plasma to not only accelerate hard tissue formation and maturation, but also to enhance the integration phase and soft tissue healing rate, has allowed the author to proceed with the Stage II procedure in as little as 2.5 months after the immediate extraction/implant placement surgical visit. The healing observed has been enhanced, and the incidence of non-integrated fixtures at the Stage II procedure at 2.5 to 3 months has been clinically observed to be less frequent than the immediate extraction/implant placement procedure without Platelet Rich Plasma, at the six-month time frame.

Simplification of the implant supported treatment plan can be achieved by using transitional implants to provide support for a provisional restoration, and by incorporating Platelet Rich Plasma, and its growth factors, into the surgical protocol to provide for a more rapid healing and maturation rate. The patient in turn experiences a less traumatic treatment phase, and realizes the final implant supported restoration in a shorter time frame.

References

1 Brånemark P-1 et al: Osseointegrated implants in the edentulous jaw. Experience from a 10-year period. Scand J Plast Recontr Surg 2 (suppl 16): 1, 1977.

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

3 Linkow LI. Implant Dentistry Today: A Multidisciplinary Approach. Padua, Italy: Piccin Nuova Libraria; 1990:439–442.

4 Linkow LI. A surgical perspective: Immediate placement of blade/plateform and self-tapping vent-plant screw implants into fresh extraction sites. J Oral Implantol 1995; 21(2): 131–137.

5 Tallgren A: The continuing reduction of the residual alveolar ridges in complete denture wearers: a mixed longitudinal study covering 25 years, J Prosthet Dent 27: 120, 1972.

6 Kent JN et al: Alveolar ridge augmentation using nonresorbable hydroxylapatite with or without autogenous cancellous bone, J Oral Maxillofac Surg 41: 629, 1983.

7 Murray VK: Anterior ridge preservation and augmentation using a synthetic osseous replacement graft, Compend Contin Educ Dent 19:69, 1998.

8 Mellonig JT, Bowers GM, Bailey R. Comparison of bone graft materials Part I. New bone formation with autografts and allografts determined by Strontium - 85. J Periodontol 1981; 52:291–296.

9 Mellonig JT, Bowers GM, Bailey R. Comparison of bone graft materials Part II. New bone formation with autografts and allografts: a histological evaluation. J Periodontol 1981; 52:297.

10 Callan DP, Rohrer MD. Use of bovine-derived hydroxylapatite in the treatment of edentulous ridge defects, a human clinical and histologic case report. J Periodontol. 1993; 64:575–582.

11 Petrungaro P, Smilanich M, Adams T. Altering the concepts of implantology for the 21st century. Contemp Esthet Restor Pract 1999; 3:30–37.

12 Petrungaro P. Fixed temporization and bone-augmented ridge stabilization with transitional implants. Pract Periodontics Aesthet Dent 1997; 9:1071–1078.

13 Froum S, Entiaz S, Bloom M. The use of transitional implants for immediate fixed temporary prosthesis in cases of implant restorations. Pract Periodontics Aesthet Dent, 10(6):737–746, 1998.

14 Petrungaro PS, Windmiller NW. Using transitional implants during the healing phase of implant reconstruction. General Dentistry: Jan/Feb 2001, 46–51.

15 Marx RE, Garg AK: Bone graft physiology with use of platelet-rich plasma and hyperbaric oxygen. In Jensen OT, editor: The sinus bone graft, Chicago, 1999, Quintessence.

16 Anitua E: Plasma rich in growth factors: preliminary results of use in the preparation of future sites for implants, Int J Oral Maxillofac Implants 14:529, 1999.

17 Petrungaro PS: Immediate restoration of dental implants after tooth removal: A new technique to provide esthetic replacement of the natural tooth system, Int Mag of Oral Implantol 2:2. 6–16, 2001.

18 Petrungaro PS: Platelet rich plasma for dental implants and soft- tissue grafting Dent Implantol Update 11:6, 41–46, 2001.

19 Lazzara RJ: Immediate implant placement into extraction sites: surgical and restorative advantages, Int J Periodontics Restorative Dent 9:333, 1989.

20 Gher ME et al: Bone grafting and guided bone regeneration for immediate dental implants in humans, J Periodontol 65(9): 881, 1994.

21 Wong K: Immediate implantation of endosseous dental implants in the posterior maxillae and anatomic advantages for this region: a case report, J Oral Maxillofac Implants 11(4): 529, 1996.

22 Babbush CA. Immediate implant placement in fresh extraction sites, Dent Surg Products 4–5:32, 1998.

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Surgical Template Fabrication and Utilization Involving Steel Tubes

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Abstract

Oral prosthetic reconstruction using dental implants is facilitated through detailed treatment planning and communication between all members of the implant team. In order to determine ideal implant position and feasibility of prospective locations, a diagnostic wax up and/or interactive CT Scan is essential. Optimal implant placement should maximize occlusal forces over the long axis of the implant, allow for parallelism and spacing between implants and proper buccal/lingual angulation. These considerations are critical for long-term success. Following determination of sites, the team leader (restorative dentist) must communicate the location for implant placement to the surgeon. Templates provide an effective and accurate method of communicating such information.

Surgical placement of implants can be difficult in the Posterior Maxilla; the use of a surgical template can prove to be an invaluable tool in locating implant sites.[1,2] A surgical template is defined by the Glossary of Prosthodontic Terms, 7th Ed. as being a guide to assist proper surgical placement and angulation of dental implants. This is not to be confused with a stent, (which is named after Charles R. Stent, who first described a different prosthetic devise

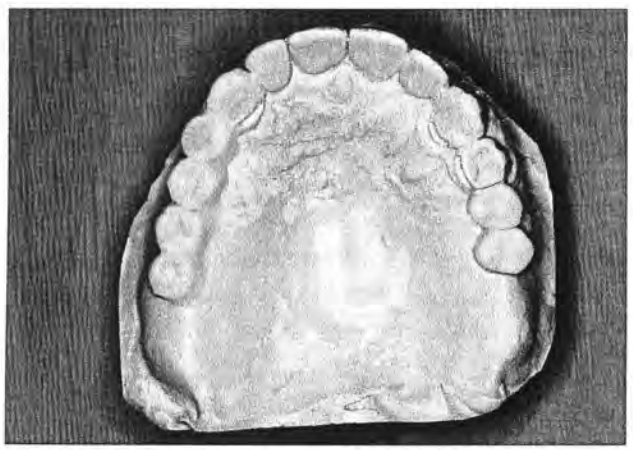

FIGURE 1 *A diagnostic small wax-up is fabricated during the treatment planning phase.*

FIGURE 3 *Occlusal holes corresponding to the ideal implant location are drilled in the second template ("tube template").*

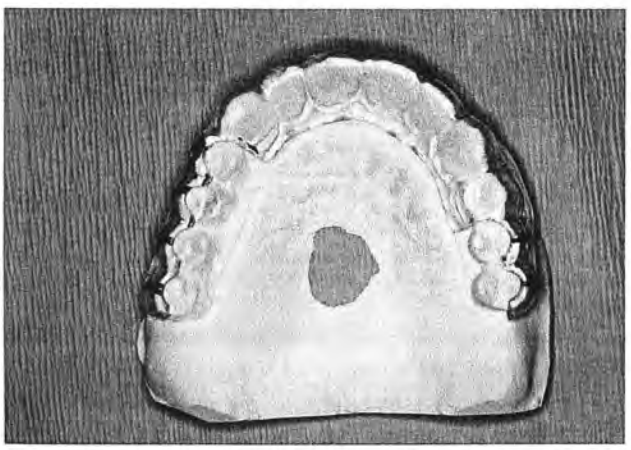

FIGURE 2 *A surgical template is fabricated with two clear acrylic sheets, the lingual flange and occlusal table are removed from one template.*

FIGURE 4 *Implant sites are marked center to center on the cast.*

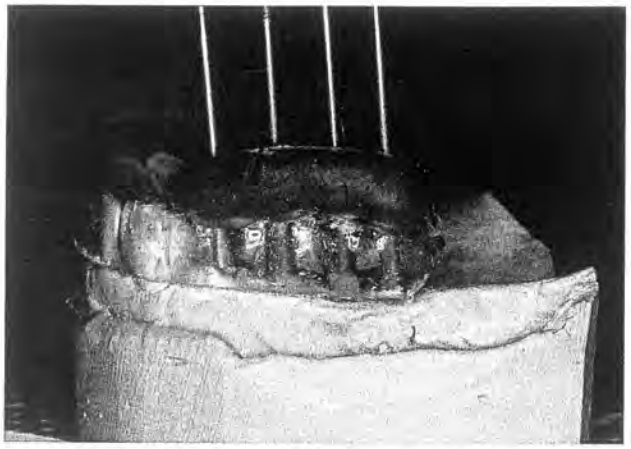

FIGURE 5 *2 mm diameter surgical tubes are inserted through the occlusal holes of the "tube template" and stabilized with utility wax.*

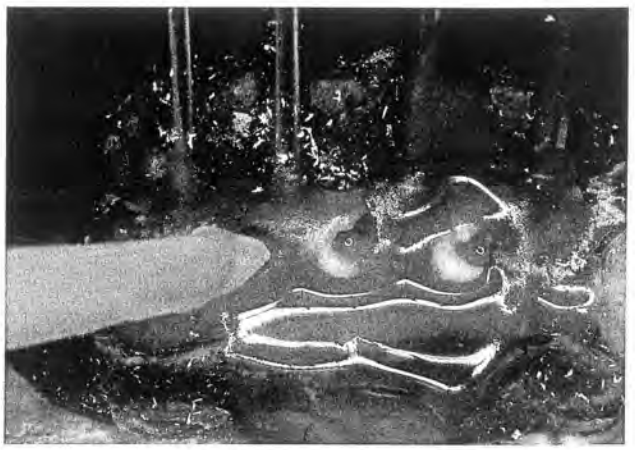

FIGURE 8 *Acrylic is injected into the "tube template" through the access holes.*

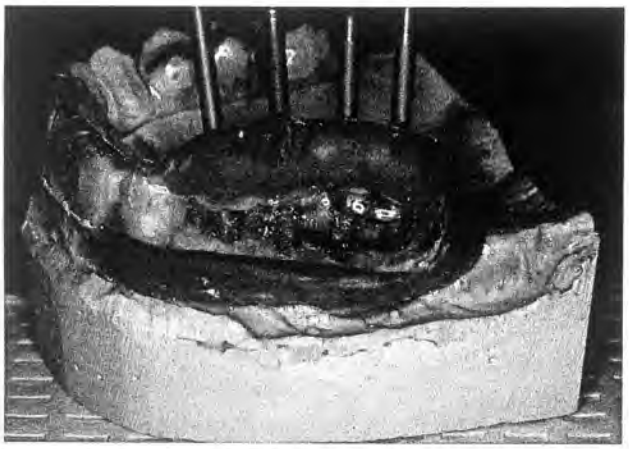

FIGURE 6 *Edges are sealed with utility wax.*

FIGURE 9 *Tubes are checked for parallelism after the acrylic has set.*

FIGURE 7 *Modified access holes are drilled on the side of the "tube template".*

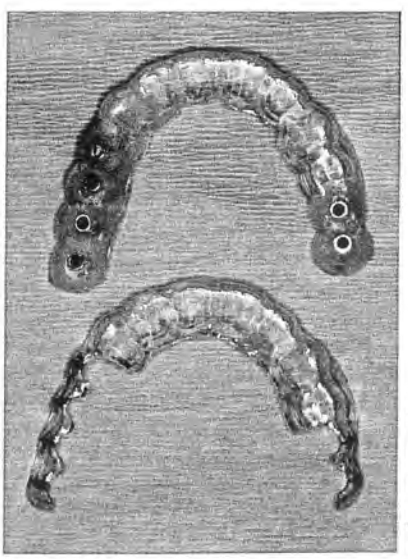

FIGURE 10 *Tube template (above) and template with lingual flange removed (below) are ready for surgery.*

than the one to act as a guide). Stents are used to apply pressure to soft tissues to facilitate healing and prevent cicatrisation or collapse.[3] This article deals with a method of fabrication and use of surgical template.

Materials and Methods

In order to begin the surgical planning process, the end result must be formulated. A diagnostic wax-up of the final prosthesis is usually required (Fig. 1) and is then duplicated in stone.

Two vacuform templates are created[4] using 0.060" clear acrylic sheets. The sheets are then trimmed to the free-gingival margins and edentulous ridge one template, the lingual flange and occlusal table are removed (Fig. 2). On the second, 2.5 mm holes are placed in the ideal occlusal positions for implants using a #8 round bur

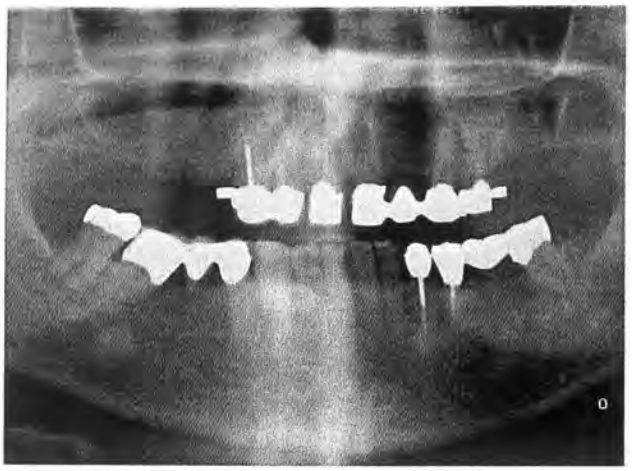

FIGURE 11 *Preoperative panoramic x-ray.*

FIGURE 14 *The template without a lingual flange is used to enlarge the osteotomy sites.*

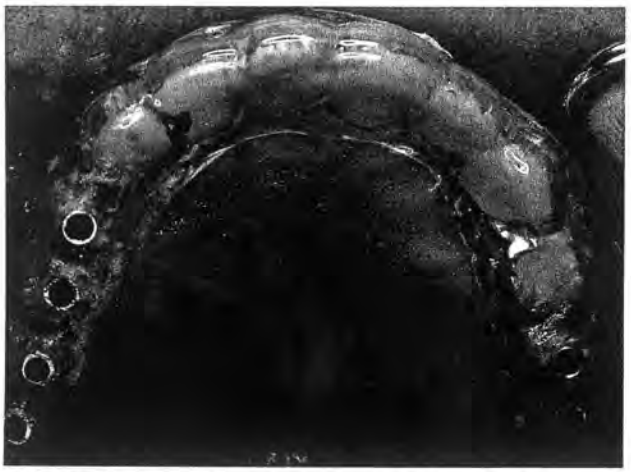

FIGURE 12 *Tube template in place after soft tissue reflection.*

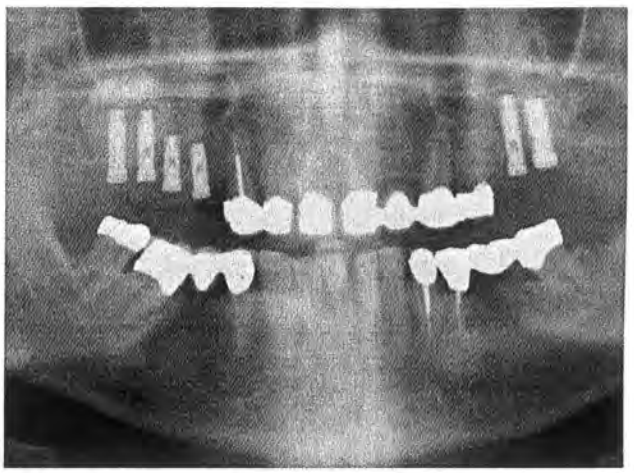

FIGURE 15 *Post operative panoramic x-ray illustrating implant placement as planned during the diagnostic phase.*

FIGURE 13 *Force direction indicators in place.*

(Fig. 3). The edentulous ridge upon the cast is marked at appropriate intervals[5] to indicate the center of implant placement (Fig. 4).

This provides the placement position of the surgical tubes. The cast is then coated with Rubber-Sep™ (George Taub Products & Fusion Co., Jersey City, NJ) to prevent the cold cure Orthodontic Resin™ (Dentsply International, Milford, DE) from adhering to the stone. The template, with predrilled occlusal holes is now placed back onto the work cast. The 2 mm surgical tubes (3i, Palm Beach Gardens, FL) are inserted through the occlusal holes and held in place using straight handpiece burs. Utility wax is used to maintain the position the burs. After the burs have been adjusted for parallelism (Fig. 5). The tubes are now ready to be set in place. Additional utility wax is placed along the edge of the template to seal any possible areas where low viscosity acrylic may escape (Fig. 6).

It is recommended that the tip of the Monoject™ syringe (Sherwood Medical Co., St. Louis, MO) be cut back to create a larger diameter opening to assist in the flow of acrylic. Holes large enough for the tip of a Monoject™ syringe are placed on the lingual flange side of the template (Fig. 7).

Acrylic is carefully injected through these lateral holes and then allowed to set (Fig. 8). Once the acrylic is set, the wax is removed and the template tubes are rechecked for parallelism (Fig. 9). Any residual wax may be removed with warm water being careful not to overheat and distort the unfilled template. After the template is cleaned and polished, it is submerged in chlorhexidine 0.12% prior to surgery (Fig. 10).

Clinical Application

A panoramic x-ray prior to sinus graft and implant placement demonstrates the presurgical situation (Fig. 11). After the surgical flap has been reflected and secured, the tube template is placed in position (Fig. 12). Pilot starter holes are prepared through the tubes followed by 2 mm diameter twist drills. The 2 mm twist drill penetrates 2 to 3 mm into the crestal bone. After making the ridge, the position of the osteotomy sites is inspected. The holes may now be drilled to length with the tube template and 2 mm twist drill. Parallel pins are used to check orientation prior to osteotomy completion and placement of implants (Fig. 13). The template with the missing lingual flange is placed into position over the arch (Fig. 14). Osteotomy enlargement is completed with this template and implants are then inserted (Fig. 15).

Conclusion

Surgical templates facilitate orientation of the ideal osteotomy site for implant placement based upon the final prosthetic result. The method described can reduce the incidence of nonparallel implant placement and root apex encroachment while maximizing occlusal load over the long axis of the implant. In addition, these templates increase surgical efficiency and accuracy thus reducing stress to the patient, surgeon and restorative dentist.

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References

1 Watzek G. Endosseous Implants: Scientific and Clinical Aspects. Quintessence, Chicago,IL; 1966:319–322.
2 Engleman JM. Clinical Decision Making and Treatment Planning in Osseointegration. Quintessence, Chicago, IL; 1996:62.
3 Perel ML. Policy, Terminology, Immiews, and Revitorial. Implant Dentistry. 2000; 9:113.
4 Misch CE.In: Contemporary Implant Dentistry. St. Louis,MO; C.V. Mosby; 1999:146–48.
5 Hobo S., Ichida E., Garcia L. Osseointegration and Occlusal Rehabilitation. Quintessence, Chicago, IL; 1996:78.

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