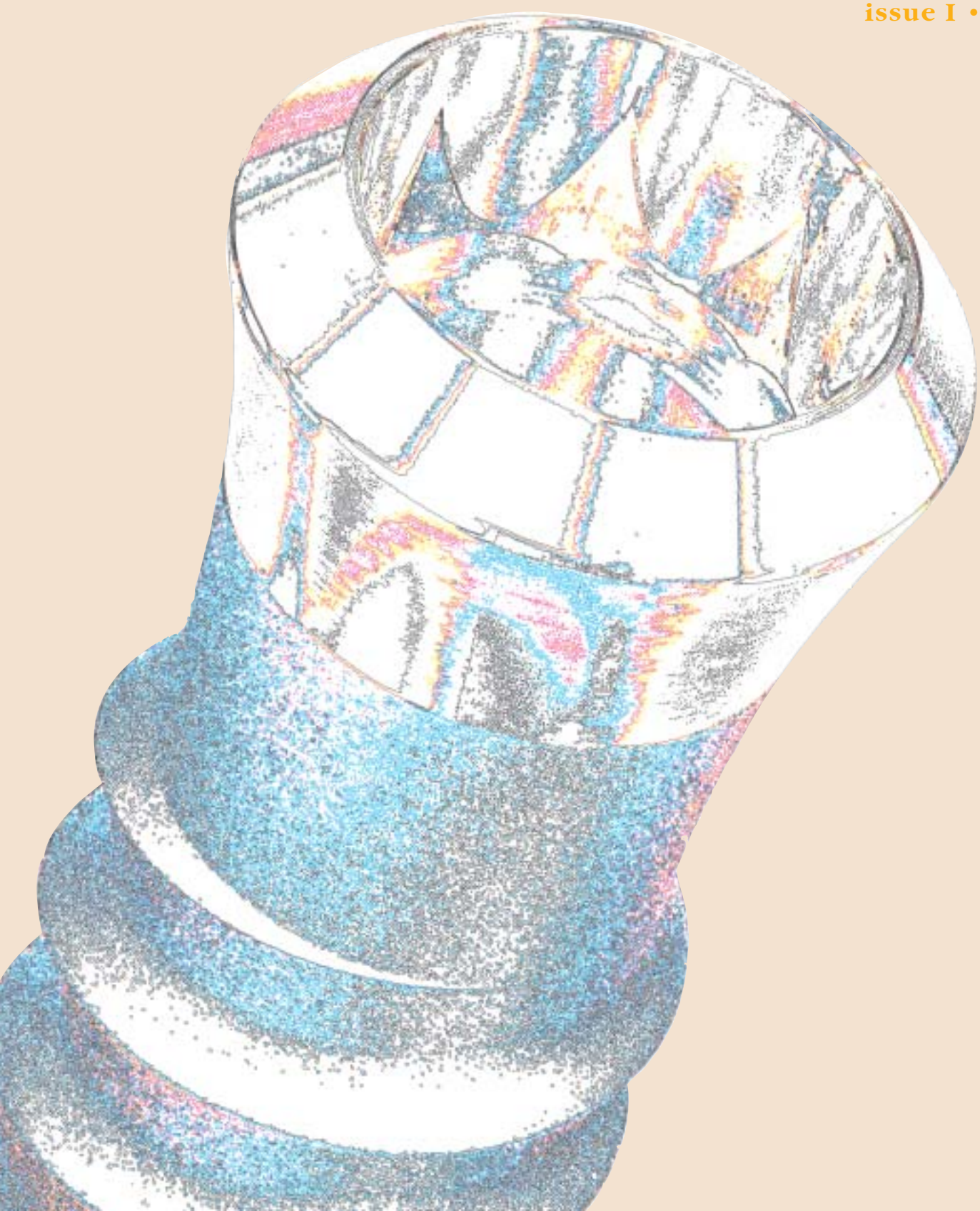
Implant Realities

Achieving success in implant dentistry

issue I • 2002



Feature *Articles*

In Every *Issue*

Welcome to Implant Realities

The goal of this publication is to address the concerns and challenges faced in clinical practice. Its contents are provided by experts from all areas of implant dentistry and reviewed by an editorial board comprised of practicing clinicians.

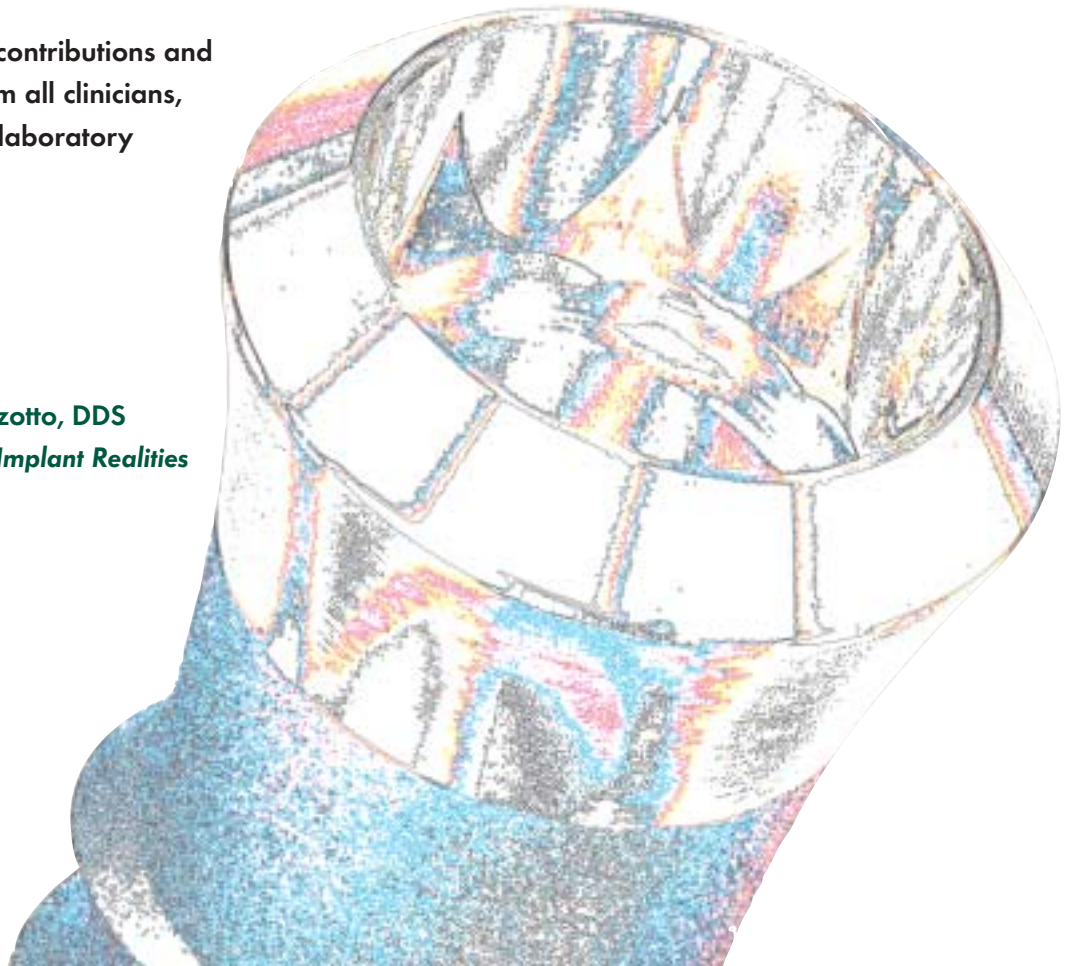
Implant Realities will explore all phases of implant dentistry, from treatment planning of simple and complex cases, through proven augmentation and implant insertion therapies, to predictable restorative options. Advances in implant design, surgical innovations and restorative techniques will be discussed in depth. Laboratory considerations and innovations critical to the delivery of predictable ideal therapy will play an integral part in our content.

Finally, the review of the pertinent dental literature, and highlighting of upcoming courses, will serve to ensure a flow of updated information that is applicable to clinical practice.

We welcome contributions and comments from all clinicians, scientists and laboratory technicians.

Sincerely,

Paul A. Fugazzotto, DDS
Senior Editor, *Implant Realities*



Practice Growth Considerations

Twenty thousand years ago, fifteen thousand distinct languages were spoken on earth. Today, humans speak six thousand separate languages, 28% of which are spoken by fewer than 1,000 people. Twenty four hundred of the remaining languages are considered endangered. Only five people are fluent in Osaga, a North American Indian language.

A parallel may be drawn to modern dentistry. As implant therapy has become more predictable and adaptable to a variety of clinical situations, we have begun to lose the language of surgical treatment modalities such as comprehensive furcation therapy, including root resection. The impact of implant therapy has been felt in the restorative field as well, as the use of Maryland bridge appliances dwindles, and single tooth replacement is rightfully more often carried out through the use of an implant and crown as opposed to a three unit fixed bridge. Dental specialties themselves have recently been challenged, as one implant company has begun to tout implants as "an alternative to root canal therapy."

While all conscientious clinicians would agree that clinical advances in implant and regenerative therapies have forever altered the dental landscape, no responsible therapist would contend that such treatment is the ideal choice in all clinical situations.

Unfortunately, an argument could also be made that the one true language of the dental community is being attenuated and even replaced by a number of individual languages.

Discussions focusing upon material costs; ease of execution; exciting, sexier techniques; and the number of various therapies performed dominate the landscape at many professional meetings. Products are touted because they are "cheaper and just as good." Newer therapies are promoted at the expense of proven, predictable treatment modalities in all situations. Clinicians enumerate how many implants, "sinus lifts" or crowns they have performed in the last year. Courses promise to provide a blueprint for increased practice growth and patient acceptance of complex cases for greater "profitability."

These discussions obscure a basic fact. The true language of dentistry is grounded in how best to care for an individual patient and meet his or her needs and desires. A patient missing a maxillary central incisor does not 'want an implant.' This patient desires a fixed tooth replacement. It is our duty to determine by which means this desire is best met for this individual patient.

The number of implants I place is meaningless. The number of patients whose problems I help to solve with my co-therapists, in the most ideal manner for each specific patient, is highly meaningful.

There is no doubt that given two treatment materials or modalities of equal predictability in a given situation, I will choose to employ the easiest of the two methods. However, such ease of execution can never replace predictability, regardless of the "slight" difference in success rate. If I am presented with two treatment options or materials of equal predictability and equal ease of use, I will naturally choose the less expensive approach and material. Once again, this decision can never be made at the expense of predictability for a given patient.

The solution to practice growth, patient volume and income concerns lies in remaining true to the one dental language. Patients come to us expecting to be treated kindly, professionally and appropriately. Patients seek a maximization of comfort, function and esthetics, regardless of the means utilized to reach these goals. Dentists work with each other if they are able to foster a relationship of trust and reliability.

If you are a periodontist or oral surgeon, and you wish to increase patient referrals, make it clear to potential referring dentists that the patient's welfare is always uppermost in your mind; that treatment decisions are never made based upon potential income; and that the referring dentist may always depend on you for honest, trustworthy answers and support.

If you are a restorative dentist seeking to increase patient flow, patient case acceptance and patient referral from other patients and dental specialists, the same rules apply. If patients truly believe you always have their welfare as your utmost concern, and that you will always treat them fairly, your practice will grow beyond imaginable limits and patient acceptance of complex cases will become the rule rather than the exception.

In subsequent columns various authors will describe means by which to ensure appropriate long-term practice growth, and to facilitate the running of a busy practice. However, none of these suggestions or approaches we will offer are useful unless spoken in the context of the true dental language.

- Paul A. Fugazzotto, DDS

Planning for Esthetics
Part 1: Single Tooth Implant Restorations

Osseointegrated dental implants have proven successful when supporting restorations treating all forms of edentulism. With this in mind, it remains difficult to clearly define parameters that lead to the successful planning and execution of treatment in the esthetic zone. In most instances this difficulty is caused by a continuing notion that patients seek implants – when in reality they seek replacements for missing teeth. While successful osseointegration remains a key to success, viewing the implant as a component of the prosthesis rather than pre-prosthetic surgery will improve diagnostic and data collection procedures with consequent improvements in the esthetic outcome.

Clearly, improvements in clinical technique (including single-stage implant placement and accelerated loading protocols) in conjunction with implant development (ESTHETIC *PLUS* implant line, SLA surface, and immediate load implants) have improved the esthetic predictability of implant-based restorations. These advances do not, however, reduce the necessity for detailed evaluation of the patient and appropriate planning for each individual site.

Diagnosis and treatment planning for the proposed implant site is multifactorial. The definitive restoration planned for the space should be the driving force in both data collection and site evaluation (Fig. 1). This information can be readily transferred between team members with appropriate template fabrication, (the process of which will be detailed in a subsequent article). Restoration-specific site evaluation will include both hard and soft tissues. The purpose is to determine the necessity for tissue augmentation, the goal of which is ideal placement of an implant capable of supporting and retaining an esthetic and functional restoration.

Hard tissue evaluation should include a two-dimensional radiographic evaluation of bone height and mesio-distal width. Radiographs should include an evaluation of the height of the bone crests on teeth adjacent to edentulous spans (Fig. 2-a,b). In general, all treatment should be planned to preserve the vertical height of these crests because of their intimate relationship to the presence of gingival papillae. Clinical evaluation of hard tissues should also determine the facial-palatal dimension of the bone site, and relate this to the proposed restoration (Fig. 3-a,b). It should be noted that residual ridge anatomy is unreliable as an indicator of bone dimension, and clinical procedures (e.g. sounding) should be employed to accurately map the osseous contour. The volume of bone must enable restoration-driven implant placement into a site conducive

Fig. 1 Pre-operative planning: diagnostic wax-up

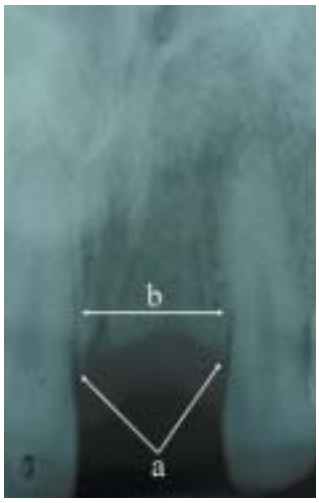


Fig. 2 Pre-operative planning: radiographic assessment

to predictable healing and volume maintenance. Of particular importance is the dimension of bone on the facial aspect of the implant with every effort made to maintain a minimum of 1mm horizontal width in this area. This can assist in preventing resorption of bone and subsequent loss of soft tissues.

The soft tissue evaluation should also be related to the planned restoration. Because we are able to place implants with predictable survival and fabricate esthetic crowns routinely with modern ceramic materials, the true esthetic success of restorations is often related to the gingival contours - particularly the presence of papillae. Soft tissue evaluation begins with the proposed gingival zenith for the planned restoration (Fig. 4-a,b). The zenith for individual teeth may be defined for simplicity as the most apical visible point of tooth, and will vary in horizontal and vertical position dependent on the specific site being restored.

Once established, the position of gingival zenith will permit the comprehensive assessment of soft tissues. The thickness and morphology of the gingival tissues is critical as conventional implant shape brings the restorative margin of the implant closest to the free gingival margin in the region of the zenith. The biologic width (being the distance from the free gingival margin to the bone), being comprised of connective tissue, junctional and sulcular epithelium, is at its minimum in this region and planning should assume minimal margin for error. The planned restoration and implant choice should therefore be mindful of this dimension (approximately 3mm) and capable of preserving it in the long term.

Bone responds readily to the position of micro-gaps between components and the position of junctions between rough and smooth implant surfaces. Micro-gap position is a dominant factor associated with bone height subsequent to implant restoration. Bone is unable to predictably remain with approximately 2mm of any gaps. Because the micro-gap between the restoration and an ESTHETIC *PLUS* implant is maintained at 1.8mm, the bone height remains predictable in the long-term. Choice of an ESTHETIC *PLUS* implant will also place the junction of the polished collar and SLA surface 1.8mm from the micro-gap. Additionally, Esthetic Plus implants allow for the planning of a subgingival restoration emergence of at least 1mm while maintaining a total biologic width dimension of 3mm. Assessment of proposed implant sites requires careful attention to adjacent structures, particularly teeth. The horizontal distance between implants and teeth (Fig. 5-a,b) should approximate 1.5mm. This dimension will help prevent significant resorption of the bone crests during healing. In addition, adequate support for the gingival tissues can be developed through emergence profile provisional restorations aiding in the maturation of gingival papillae.

Lastly, to further enhance the development of gingival papillae, the planned restoration should be related to the anatomy of each individual site. Every effort should be made to plan for implant placement which allows for the contact points between the teeth to be placed within 5-6 mm of the bone crests (Fig. 5-c,d).

In summary, the implant site should allow for positioning of the implant restorative margin 1-2mm

Fig. 3 Pre-operative planning: horizontal width and proposed emergence

Fig. 4 Pre-operative planning: gingival zenith and papilla

Fig. 5 Planning implant placement

apical to the proposed position of the gingival zenith, while preserving distances from adjacent tooth structures and proposed contact points. Because the restorative margin for the ESTHETIC *PLUS* implant represents a micro-gap, bone will reposition a further 2mm apical to this junction. For improved predictability the implant should also place the junction between rough and smooth surfaces 2mm from the gap, as is the case with the ESTHETIC *PLUS* implant. This implant position must be accurately described by a series of surgical templates provided to the surgeon if predictable esthetic results are to be achieved. An inability to place the implant according to the plan dictated by the proposed restoration is an indication for site enhancement as the reliability of esthetic restorations fabricated on implants positioned less than ideally is questionable at best.

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Fig. 6 Final restoration (six months)

Fig. 7 Periapical radiograph (six months)

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Early Loading with the ITI SLA Surface as a Predictable, Routine Procedure

Treatment planning permanent tooth replacement with dental implant supported restorations often competes with conventional prosthetic procedures for a number of reasons. Historically, patients were often discouraged at the prospect of multiple surgical procedures, long delays between initiating and completing treatment and questionable predictability of implant procedures as compared to fixed partial dentures. Similarly, general dentists who make the majority of the treatment planning recommendations express similar concerns combined with cumbersome, unfamiliar prosthetic procedures, potentially uncontrolled laboratory fees and reduced profitability.

Implant dentistry has advanced tremendously to address the objections and challenges of the past. Many of these improvements are evidenced in contemporary practice. However, one of the most significant developments is the routine use of reduced healing time (42-56 days) that was recently documented with 4.1 mm diameter ITI SLA surface implants. Published in the April, 2002 Clinical Oral Implant Research, Cochran, Buser et al. summarized the results of their prospective clinical trials from 6 centers in 4 countries. In types I, II and III bone, implants were allowed to heal for 42-56 days (mean 49 days), and were then subject to abutment placement at 35 Ncm without counter-torque. Prosthetic restoration was completed on 307 implants. The success rate at abutment placement was 99.3%. Life table analysis of the longitudinal data demonstrated an implant success rate of 99.1% at 1 and 2 years.

Fig. 1 Healed day 42

Fig. 2 Abutment connection at day 42

The clinical implication of this study is that patients and dentists do not need to wait for months to complete treatment. Further, the predictability of the implant-supported restorations can be shown to compete with or exceed that of fixed partial dentures in light of the potential complications of bridge fabrication, endodontic involvement of abutments and recurrent caries.

In the case illustrated below, a healthy, 67 year-old male presents with a history of bruxism, and a lower right fixed partial denture which failed due to recurrent caries and fracture of the anterior abutment. His fixed therapeutic alternatives included a fixed bridge extending from tooth #27-28-X-X-31 or single crowns on #28, 29 (I) and 30 (I). The patient indicated a preference for single-tooth restorations to a fixed prosthesis, so other bridge options were eliminated. After endodontic therapy was performed on the remaining bicuspid, periodontal crown lengthening (clinical crown extension) was performed. During the same procedure, 2 ITI SLA 12mm implants were placed into moderately dense (type II/III) bone in ideal positions. 42 days following periodontal and implant surgery, solid abutments were torqued to 35 Ncm and the patient was referred back to his general dentist for final impressions. Three weeks later, 3 single crowns were cemented restoring optimal hygiene and function.

Success was optimized as follows: Implant position was properly anticipated and communicated so correct placement was assured and unexpected restorative complications and laboratory expenses were avoided. The surgeon positioned the implants properly and returned integrated, healed teeth and implants with healthy surrounding tissues. Finally, the laboratory technician was completely familiar with the implant restorations to insure seamless, predictable results.

This case illustrated how optimal prosthetic results can be obtained using evidence-based principles combined with sound surgical, endodontic, restorative and laboratory techniques. Ideal results were obtained for this patient in less than 10 weeks including adequate healing time for all procedures and laboratory time.

- **Jeffrey Ganeles, DMD, FACD, Diplomat American Board of Periodontology**

Fig. 3 Final restorations

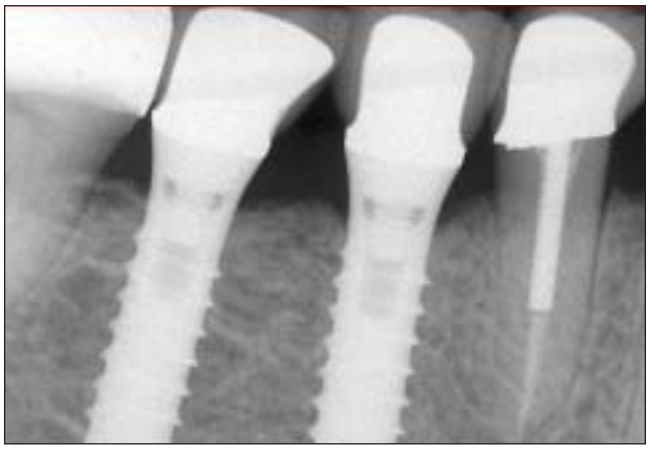

Fig. 4 One year post-restoration

The author would like to acknowledge the meticulous restorative dentistry of:

Dr. Norman Lurie, Boca Raton, FL
and
Michael Hahn, MDT, DAS Dentalabor, Boca Raton, FL

Fig. 1 Patient at presentation

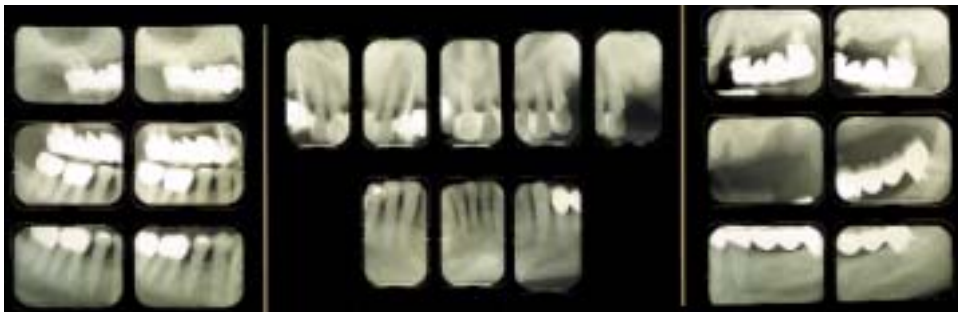

Fig. 2 Full mouth initial radiographs

The Immediate Load Full Maxilla Utilizing synOcta®

From Teeth to Fixed Implant Supported Bridge

Recently, immediate loading of dental implants has become accepted and wide spread. Many authors have published impressive results which have validated the concept. Researchers have demonstrated not only successful integration with immediate load, but also greater bone to implant contact compared to unloaded delayed healing implants.

The keys to a successful case include comprehensive presurgical evaluation involving an interactive CAT scan (Simplant), a waxed-up case mounted on an articulator and communication between the surgeon, restorative dentist, laboratory and the patient. The restorative dentist must make accurate casts, mount them and wax-up the final tooth position. The tooth position can be replicated in a surgical template which may be radio-opaque if necessary for the CAT scan.

The CAT scan evaluation entails many factors. Bone density is the most important determinant since micromotion (movement > 150 microns) will lead to implant loss. The second requirement is adequate volume to place the implant. Finally, the interactive CT can show how the implants will relate to each other. This will help the restorative dentist select the appropriate abutment before implant surgery.

The normal anatomy and resorptive pattern in the edentulous mandible permits implants to be placed parallel to each other. However, in the edentulous maxillary arch, the bone resorbs apically and palatally. This produces a situation where the posterior implants may not be parallel from one side to the other and the anterior implants will flare labially. As a result, immediate loading of the full maxilla becomes more difficult with regard to splinting the implants, abutment selection and provisional fabrication. The ideal way to solve this dilemma is by indexing the implants and constructing a master cast. Abutment selection to parallel the implants could then be performed with the provisional fabricated on the model and then delivered to the patient.

The following case report will demonstrate how a patient with a hopeless maxillary dentition will be converted into a fixed implant supported bridge utilizing indexed immediately loaded ITI implants.

The patient, an 82 year old healthy white male, presented for evaluation. He had been told that his remaining maxillary dentition was hopeless and that he would need to wear a full denture before implants could be placed (fig 1).

Radiographic analysis of a full series of periapicals revealed that adequate bone was present for implants in the area of the bicuspids and anteriors (fig 2 &3). The concept of immediate loading of implants was explained and that an interactive CAT scan would be necessary to determine bone quality and volume. Scan assessment revealed ample bone volume present at sites 4, 5, 7, 10, 12, 13 to place implants of 10-12mm (fig 4). The density at these sites was sufficient for immediate load (fig 5). Evaluation of the implant positions showed that parallelism of the six implants would not be achievable

Fig. 3 Maxillary initial radiographs

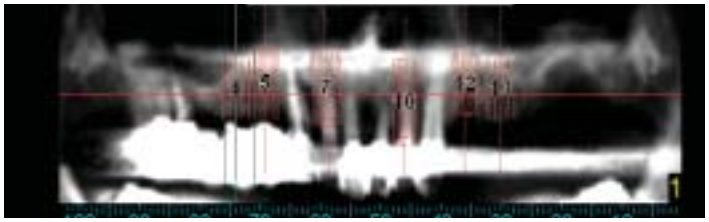

Fig. 5 CT showing density of posterior implants

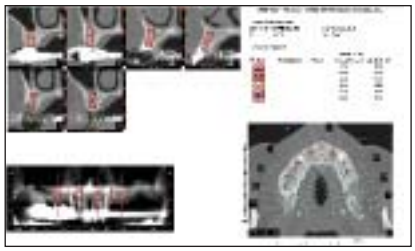

Fig. 4 CT preview showing location, position and size of implants

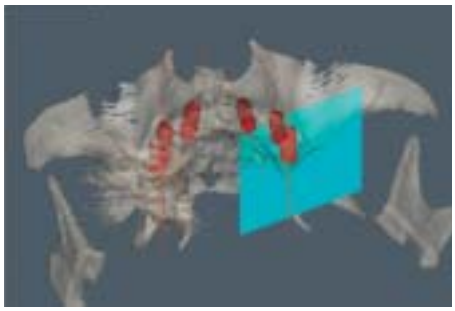

Fig. 6 CT showing 3-D image of implant position relative to each other

(fig 6). Therefore, indexing the implants after placement would be necessary.

The prosthodontist discussed the various treatment options with the patient. Since no teeth could be used for support for an interim fixed prosthesis, treatment options were a full denture or a fixed immediate load implant bridge. The patient opted for the latter.

Due to the resorptive pattern of the maxilla, selecting abutments to parallel the implants in the edentulous jaw would be difficult. Furthermore, a fair amount of chair time would be necessary to fabricate the provisional restoration. Therefore, it was decided to impression the implants post-surgically. A model with the indexed implants would afford the prosthodontist the ability to select abutments and construct the temporary.

At the next visit, teeth 6 and 11 were prepped and temped. These teeth would serve as a positive seat for the provisional. Impressions of the maxilla and mandible were taken. The casts were poured and mounted. The maxillary teeth waxed to the desired tooth position. An acrylic shell was fabricated which would be used as a fixed provisional resting on 6 and 11. Once the bridge was in place they (6&11) would be removed.

On the day of surgery, the patient was premedicated with 1 gram of Amoxicillin. The mucoperiosteal tissues of the maxilla were infiltrated with 2% lidocaine with 1:100,000 epinephrine. The posterior bridge was removed. Teeth 7-10, 12 and 15 were extracted (fig 7). Six and 11 were maintained to serve as an aide in aligning the implants at 5, 7 10 and 12 as well as providing stops for the provisional. The initial osteotomies at 7 and 10 were drilled at 2.2mm to proper M-D and B-L position. Subsequently, sites 5 and 4, followed by 12 and 13 were developed to 2.2mm, with an attempt to achieve parallelism. The osteotomies were widened to the appropriate diameter (fig 8), tapped and the implants installed (fig 9). All sites were then checked to be certain that an impression coping could be snapped onto the collar of the implant. If bone interfered with the coping, the osseous overhang was removed with a chisel. The soft tissue was recontoured around the implant shoulders. The impression copings were then snapped onto the implant shoulders with the synOcta® positioning cylinder placed (fig 10). The flaps were then loosely coapted with 4-0 silk suture. A polyvinyl impression of the maxilla was taken with the impression copings and positioning cylinders attached to the implants. Cover screws were then placed over the implants and the patient was discharged (fig 11).

Analogs were attached to the impression (fig 12) and a master model with a soft tissue cast was poured in a low expansion die stone. Appropriate abutments utilizing the synOcta® plastic planning kit were chosen. A 5.5mm solid abutment was utilized at 4 and 12, while at site 5, a 7mm solid abutment was used. synOcta® 15°, type A abutments were selected for 7, 10 and 12 (fig 13). A palatal jig was made to duplicate the positions of the angled abutments in the mouth. The acrylic shell was placed over the cast to check for clearance. The metal abutments were placed on the model and the shell seated on 6 and 11. The provisional acrylic was added and the shell convert-

Fig. 7 Extraction

Fig. 8 Directional indicators showing lack of parallelism

Fig. 9 Implant installation

Fig. 10 Impression cylinders and indexing indicator in place

Fig. 11Post-op radiographs

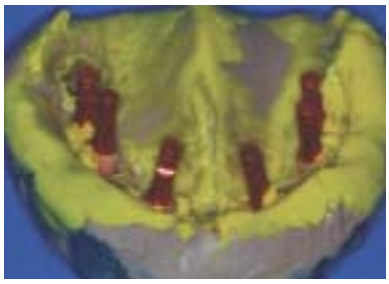

Fig. 12 Impression with analogs in place

Fig. 13 Master cast

Fig. 14 Abutments placed at 72 hours

ed to a well contoured, polished provisional.

The patient returned to the prosthodontist 72 hours after surgery. The cuspids were extracted and the cover screws removed. The solid abutments were placed at 4, 5 and 12. The jig was introduced onto the palate and the 15° abutments were appropriately positioned. All posts were hand tightened. The access holes of the angled abutments were blocked out with cotton pellets and composite (fig 14). The provisional was relined again in the mouth to insure accurate fit. The provisional was removed and impression caps were placed on the implants to maintain retraction of the soft tissue. The coronal half of the impression cap was modified to fit over the angled abutment. Excess acrylic was trimmed. With analogs in the temporary, additional acrylic was painted around the gingival margins to mimic the proper emergence from the soft tissue. This would create a natural profile for the final restoration. The provisional was trimmed and polished to the exact edge of the implant shoulder with the aid of an analog. The provisional was tried-in and ovoid pontics developed for 6, 8, 9 and 11. The occlusion was adjusted with centric contacts on the center of the implants. The provisional was polished again and sealed with Palaseal. Final temporary cement was utilized to secure the provisional (fig 15). At two weeks, the sutures were removed and the occlusion was checked again. The patient was not seen again for ten weeks.

The patient returned at twelve weeks to verify integration. The provisional bridge was removed for the first time since cementation (fig 16). The temporary cement was present in each retainer, validating the passivity of the provisional bridge. The abutments were torqued to 35Ncm. The patient experienced no sensation or movement of the implants. Radiographs were taken. The implants were deemed as integrated and the patient went back to the prosthodontist for final restoration (figs 17, 18, 19).

This case is of interest for

many reasons. It demonstrates how important preoperative treatment planning and communication are so that a complex case may be precisely executed, with all variables taken into consideration. As a result, the implants could successfully and easily be loaded at installation.

Utilizing indexed implants, a master model was created the day the implants were installed. From this cast, abutments which were parallel were selected and placed and a precise provisional fabricated. It was delivered with few adjustments within 72 hours. This technique therefore diminished the number of hours that the patient spent in the dental chair.

This case report exhibits how patients with a failing dentition may successfully be converted to an implant supported prostheses with minimal chair time and a great deal of expertise.

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  Jorge Barrios, DDS
  Akshay Kumar, DMD

Fig. 15 Provisional in place

Fig. 16 Abutments and tissue at 12 weeks

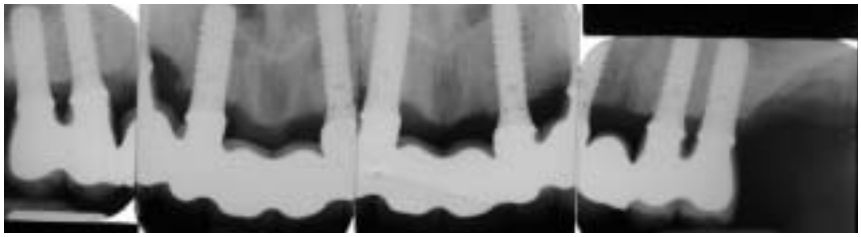

Fig. 17 Radiographs of final restoration

Fig. 18 Buccal view of final restoration

Fig. 19 Palatal view of final restoration

Practical Implant Pearls:

Provisional Crown Fabrication for Solid Abutments

It is just another busy day in the life of your practice. You wrap up a new patient consultation and immediately head for the hygiene patient waiting to be checked in the next operatory. Without missing a beat, you pick up the stack of phone messages piling up on your desk and glance at the schedule. Mrs. Jones is coming in today for you to restore her ITI implant. It seems like she just had that implant placed the other day, but you refer to the progress notes in her chart and realize it has already been 6 weeks since her surgery. As you wonder where the time goes, your office manager alerts you to an unscheduled emergency patient being worked into your already hectic afternoon schedule. It is days like this that call for a simplified method to help you fabricate a provisional crown on an ITI solid abutment. This practical implant pearl will help demonstrate the technique to create an accurately fitting provisional restoration. In addition to covering and protecting the implant abutment, your provisional crown will begin to load the implant, support and shape the gingival tissues, and provide your patient with an esthetic and durable temporary tooth replacement.

In this particular situation we are restoring the patient's missing lower right first molar (#30) which was lost following a failed endodontic treatment. An ITI wide neck implant was placed in the edentulous site with the aid of a surgical template and the patient was allowed to heal for 6 weeks. Upon removal of the healing cap with an SCS screwdriver, a 4mm WNI solid abutment is carried to the implant and screwed into place with finger pressure (Fig. 1). At this point it is wise to confirm that the abutment height selected allows for adequate occlusal clearance. Once you select and place the appropriate sized solid abutment, you must firmly affix it within the Morse taper of the implant body. This is accomplished by tightening the abutment using 35Ncm of force with the Straumann torque wrench. A pick-up impression coping can then be snapped onto the implant shoulder, and the matching positioning cylinder is aligned and pressed into place over the solid abutment (Fig. 2). At this point you will make your final impression using the elastomeric impression material of your choice. Most standard crown and bridge type poly-vinyl siloxanes work nicely (Fig. 3).

If everything goes according to plan, your abutment connection and final impression will require about 15 minutes of chair time…much less time than is required for a conventional crown preparation. Often times, these implant restorative procedures do not require the use of anesthetic! With only a few precious minutes of time remaining before your next emergency patient is seated, you must somehow make a provisional crown over the implant. Although you have the option of cement-

Fig. 1 4mm WNI solid abutment

Fig. 2 Impression transfer

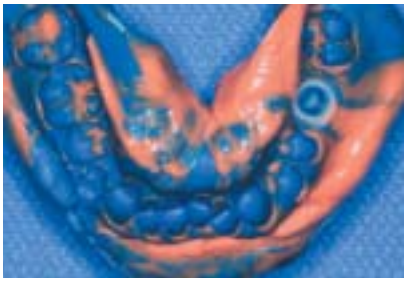

Fig. 3 Final impression

Fig. 4 Color-coded restorative components

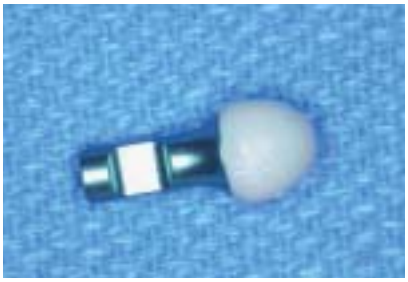

Fig. 5 Acrylic resin applied to implant analog

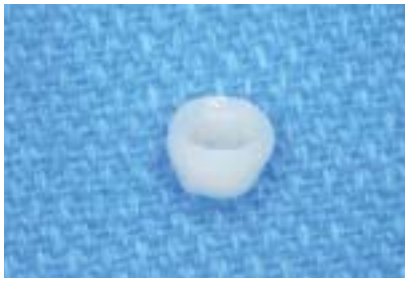

Fig. 6 Completed provisional "cap"

ing a prefabricated protective cap over the implant abutment, you will learn it is not difficult to create a provisional crown with a small amount of effort. More and more patients are demanding higher quality service and are expecting a high value in return for their hard-earned money. In an effort to exceed this demand, today's top implant clinicians will be expected to provide implant provisional crowns as they would for any prepared tooth.

In order for this process to be most efficient with your chair-side time, it will require you to do some advance preparation. Take the color-coded implant/abutment analog from your impression kit (Fig. 4) and paint a layer of petroleum jelly on the analog as a separating medium. Mix together an acrylic resin provisional material and apply it to the abutment surface area (Fig. 5). All conventional methyl-methacrylate (power-liquid combination resins) work well for this process. These materials allow you to add to the same material and will adhere chemically to a previously set mix. Allow the material to cover the abutment and run down to the implant margin. It is important to ensure that the acrylic completely covers the implant shoulder/margin. If extra material runs over the margin it can be trimmed back after it has finished setting. Once the resin has cured, gently remove it from the analog with a hemostat (Fig. 6). These "prefabricated" provisional copings can be made up for all sizes of the standard ITI implant solid abutments (4mm, 5.5mm, and 7mm) and the wide neck implant solid abutments (4mm and 5.5mm). Often, this process is completed well in advance of the patient's arrival in the office and extra copings are kept in the implant prosthetic organizer along with various other implant components.

Now that you have made your impression, retrieve an acrylic coping for the 4mm WNI solid abutment. Take this coping to the mouth, place it over the abutment, and press it into place (Figure 7). Because you have already captured the margin of your provisional implant restoration, the preformed acrylic resin cap will displace soft tissue in any areas that are sub-gingival. At this point you will fill a clear, vacu-formed coping with a new mix of acrylic resin and seat it over the resin cap and the adjacent teeth (Fig. 8). It is noteworthy to mention that bis-acryl resin provisional materials that are dispensed from automix cartridges do not work as well for this technique. The simple reason is that the oxygen-inhibited layer that forms on the surface of the resin prevents bonding of the same material and you will not successfully "pick-up" the acrylic coping in the vacu-formed shell. Flowable composite resins have been suggested to add to these materials but are often messy and expensive. The simplest method is to use a resin (such as a methyl-methacrylate) that allows you to add an additional mix that will chemically adhere. As with any provisional restoration, take care not to lock the acrylic into adjacent tooth undercuts. Check occlusal contacts with articulating film and adjust accordingly. The provisional restoration is then polished and cemented into place with a small amount of temporary cement (Fig. 9). Carefully remove any excess set cement beyond the margin and instruct your patient in home care as you would for any provisional restoration.

As you dismiss the patient, she turns and thanks you for her new implant tooth. She smiles and remarks that it feels like a real tooth and she can't believe it was that easy and painless. You return a smile of your own and enjoy the moment…it's just another busy day in the life of your implant practice.

- Scott E. Keith, DDS, MS

Fig. 7 Acrylic "cap" seated over abutment

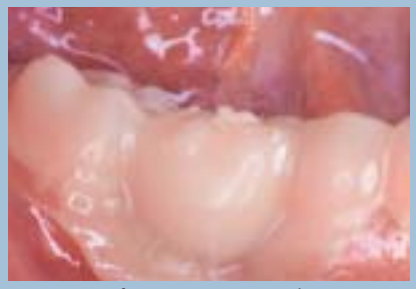

Fig. 8 Vacu-form coping to pick-up resin

Fig. 9 Completed provisional restoration

Emergence Profile and Implant Depth

Fig. 1 The side mesio distal width of the tooth to be replaced (11mm) requires the implant to be countersunk more deeply. The central incisor was restored using an octa abutment, a UCLA type gold coping with a cemented porcelain fused to metal crown.

The ITI® implant system offers the most research of any "one stage" implant design.[2,4,5] With this design in posterior sites, placement depth is routine. However, altering placement depth with the ITI® system allows for flexibility and optimal esthetics in the anterior region.[1] The standard placement depth calls for the SLA surface to be subosseous and the machined surface to serve as the transmucosal portion. The ITI® implant has a 1.8mm or 2.8mm machined collar, to accommodate different soft tissue thickness. The ESTHETIC *PLUS* solid screw implant was designed for anterior sites with the 1.8mm machined collar. Ideally, an interproximal scallop of the SLA implant surface would be present to enhance preservation of the osseous profile. Such a design is not yet available clinically. Different collar heights alone cannot accommodate for the sharp scallop of the osseous architecture in the esthetic zone. The soft tissue thickness, anatomical interproximal osseous scallop and osseous thickness all affect the depth of placement for an optimal cosmetic result.

In order for the facial aspect of the implant bevel to be placed subgingivally, the interproximal aspect of the implant must often be placed subcrestally. Subcrestal placement of a smooth machined titanium surface does not promote osseointegration and should be limited when possible.[4] Two stage systems predictably demonstrate crestal osseous "cupping" (i.e. bone loss) to the first implant thread after abutment attachment due the close proximity of the microgap.[6,7,8] The ITI® system may have to be somewhat countersunk due to esthetic concerns but does not require placement as deep as many two stage implant designs. This is due to the flare from the implant body to 4.8mm at the implant neck. How deeply should you countersink the implant to attain appropriate esthetics, without causing subsequent bone loss?

The mesial distal diameter of the tooth being replaced is a critical aspect to consider. The ultimate esthetic result is dependent upon the soft tissue form being well supported by the implant and restoration emerging from a subgingival location. Such a transition cannot occur over a distance of 0.5-1mm. Therefore, the implant neck must be placed deeper subgingivally to develop the gingival and papillary form. Most central incisors are >9mm in width. If the incisor is 10-11mm wide, the 4.8mm implant neck must be placed deeper than in the case of a 9mm wide incisor.

The gingival thickness as a thin scalloped biotype is

Fig. 2 A radiograph one year after placement of the final restoration.

also a factor in depth. If the width of the tooth to be replaced is <9mm, the implant neck may be placed closer to the facial gingival margin. Such placement allows utilization of a cemented restoration, with margins 1-1.5mm subgingival facially and 2-3mm subgingival interproximally. When a pronounced scallop is present, or the mesial – distal width to be considered is >9mm, the implant is often countersunk 1mm coronal to the facial osseous crest. The interproximal neck of the implant is now often 1-1.5mm subcrestal. The emergence profile may be developed smoothly, and there is room for an appropriate transition of porcelain color and form.

The type of restoration to be utilized is a factor when considering the depth of implant placement. A solid abutment with a cemented crown may not be appropriate, as the interproximal margin could be as much as 4-7mm subgingival. The potential for retained subgingival cement in such a situation is very high.[9] The ITI® system offers great flexibility with other abutment options. Use of a synOcta® or octa abutment allows fabrication of a screw retained restoration, or a cemented restoration with a customized cement margin level. A transverse screw restoration is also an option, although it is primarily designed for use with maxillary central incisors.

Use of a synOcta® or octa abutment with a cemented restoration is simple, versatile and highly esthetic. A cast-on gold, machined abutment is used to fabricate a UCLA type of abutment. A ceramic restoration with a customized finish line is now cemented on the abutment. Such an approach may be used in maxillary central or canine sites, where the implant is countersunk more deeply. Lateral incisors are often restored with solid abutments as the reduced diameter of the tooth usually does not require as much depth. If the diameter of the lateral incisor to be replaced is very narrow, a narrow neck implant is used, and countersunk as necessary, often to a depth of 1-1.8mm coronal to the facial osseous crest, as described previously for the ESTHETIC *PLUS* implant.

The use of the ITI® system in the esthetic zone offers the combination of a proven implant design, a predictable, well-researched SLA surface, and a wide range of abutments and restorative options. Implant placement with any system must be well planned, with attention paid to implant angulation and depth of placement, as these are critical aspects of success. Familiarity with the system and the discussed guidelines will make placing and restoring ITI® implants routine in esthetic sites.

- Bobby Butler, DDS

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Clinical Procedures for the Conversion of a Denture to Implant Retained Utilizing the ITI Retentive Anchor Abutment and Gold Matrix


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On many occasions, patients require greater retention to stabilize their dentures than conventional treatment modalities allow. The lack of financial resources to completely remake their prosthesis often further complicates the situation. One treatment plan to deal with such a problem is the utilization of two or more implants with retentive anchor abutments, and the addition of retentive elements for increased stability and retention. To reduce laboratory expense and time, the simplest way to accomplish this end is to retrofit the existing denture intra orally in the office.

A classic example is illustrated below: The patient presents with a relatively new prosthesis (Figs. 1 & 2). One of the easiest and most affordable abutments to use is the Retentive Anchor Abutment (Fig. 3). An abutment driver is available which fits the torque control device (Fig. 4), and is used to place the abutment in the implant. The healing caps are removed with the SCS screwdriver (Fig. 5). The internal aspect of the implant is evident (Fig. 6). The retentive anchor abutments are placed with the Torque Control Device adjusted to 35Ncm (Fig. 8).
An indicating medium is used to locate the position of the implants and abutments in the denture. The denture is relieved in the area of the implants to allow complete seating of the denture with the abutments in place (Fig. 11). The preferred method of relief is to


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create a complete window over the implant to improve access to the attachment. The abutment must now be blocked out so that the self-curing resin cannot migrate under the abutment or implant margin, utilizing "rope wax" or "ortho wax " (Fig. 8). It is placed over the abutment and implant and molded into shape (Fig. 9). Utilization of the wax makes paralleling the attachments easier, and reduces the possibility of the attachments changing position. Once the wax is in place, the gold matrix is pressed into position and paralleled by eye (Fig. 10).

The denture is tried in and checked for any impingement of the attachment on the denture base (Fig. 12). If there is contact between the acrylic and the attachment, more relief is needed. With the denture in place, self-curing resin is applied to the attachments and the denture base (Fig. 13). The resin is allowed to fully cure (usually about 5 minutes) (Fig.14). When the resin is hard to the touch, it is "unsnapped out" and the internal adaptation of the acrylic is checked (Fig. 15). If no voids are noted the exterior of the denture is polished. The case is complete. This procedure takes no more than an hour to perform. Most patients notice an immediate sense of stability and comfort.

Instruments are available to increase or decrease the degree of retention to the desired level.

- Terry Charters


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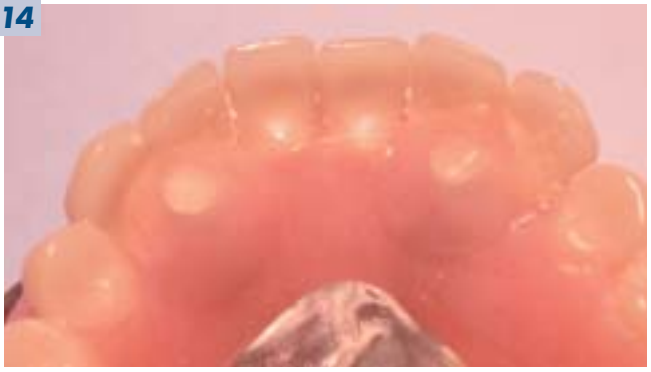
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Transforming Treatment with Guided Bone Regeneration

Part 1 Managing the Soft Tissue

The advent of simple, predictable Guided Bone Regeneration (GBR) therapy has significantly altered both the treatment planning and therapeutic phases of everyday clinical dentistry. Once thought of as a complex treatment modality necessitating multiple surgical sites and the procurement of oral and/or extra oral autogenous bone, GBR therapy is now recognized as a straightforward procedure which does not require the use of an of autogenous bone graft to effect ideal treatment results. The literature has demonstrated the ability to predictably regenerate large quantities of lost alveolar bone through the utilization of appropriate surgical designs, particulate materials and membranes.

Nowhere is the impact of GBR therapy upon treatment planning and subsequent therapy more evident than in the transformation of tooth extraction into a reconstructive event.

Rather than hoping for manageable post tooth extraction ridge atrophy and subsequent soft tissue collapse, the clinician may now utilize the tooth extraction visit as an opportunity to perform appropriate regenerative therapy and significantly enhance the subsequent hard and soft tissue morphology (Figs. 1-4).

The prerequisites for the maximization of GBR therapeutic outcomes have been well elucidated in a number of publications, and include:

I. Appropriate flap design and suturing to ensure attainment and maintenance of passive primary closure throughout the course of hard tissue regeneration.

II. Complete debridement of the site to augmented.

III. Decortication of the regenerative site if appropriate.

IV. Clot isolation and protection through membrane placement.

V. Selection of an appropriate membrane to ensure precise recreation of the desired morphology of the bone to regenerated.

VI. Membrane stabilization.

VII. Control of overlying postoperative forces.

While performing GBR therapy, the attainment and maintenance of primary soft tissue closure throughout the course of regeneration is recognized as one of the greatest challenges facing the treating clinician.

This challenge is predictably met through the utilization of proven flap designs:

A. Buccal and lingual releasing incisions are utilized on the mesial and distal extents of the mucoperiosteal flap to be reflected, which extend well beyond the mucogingival junction. Palatal releasing incisions are placed a distance of at least one tooth mesial and distal from the site to be regenerated.

B. Horizontal extensions of the buccal and lingual releasing incisions are utilized as necessary to increase flap mobility. While commonly 3-4mm in length, these horizontal extensions may reach up to 8-10mm in length.

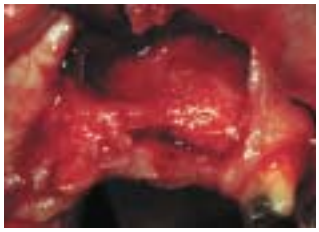
C. Full thickness flap reflection is carried out, including reflection of the “triangle” bordered by the vertical releasing incisions, its horizontal extension, and the hypotenuse connecting these two incisions.

D. The above releasing incisions are adequate for attainment and maintenance of passive soft tissue primary closure in

Fig. 1

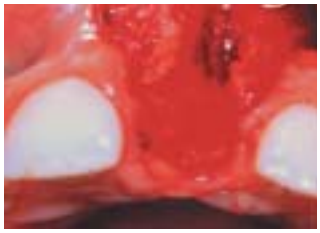
A significant osseous defect is present following extraction of a maxillary cuspid.

Fig. 2



Note regenerated bone in the cuspid site, compared to the lateral incisor area of prior extraction.

Fig. 3



A severe osseous defect is evident following extraction of the central incisor.

Fig. 4

Guided bone regeneration is performed without the use of autogenous bone grafting.

Fig. 5

A full thickness palatal flap is reflected.

Fig. 6

An internal incision is made 3-4mm from the base of the palatal flap.

Fig. 7

The palatal flap is dissected in apical coronal direction.

Fig. 8

The dissected internal aspect of the palatal flap is reflected coronally and outwardly, extending the length of the palatal flap.

the vast majority of situations. However, when significant maxillary augmentation therapy is to be performed, the relative immobility of the palatal flap may mandate additional flap modification to ensure passive soft tissue primary closure. In such a situation, a rotated palatal pedicle flap is employed.

1. A full thickness palatal flap is reflected with appropriate releasing incisions as previously described (Fig. 5).

2. An incision is made along the internal aspect of the palatal flap approximately 3mm coronal to the base of the flap (Fig. 6).

3. Utilizing a 15 blade and a 1 2 tissue forcep, the internal aspect of the palatal flap is split in a coronal direction, beginning at the aforementioned internal horizontal incision (Fig. 7).

4. The dissected internal aspect of the palatal flap is reflected coronally and outwardly, thus increasing the apico occlusal dimension of the palatal flap (Fig. 8).

When employing such a flap design, it is imperative that the patient be placed in an appropriate supine position to allow adequate visualization. In addition, the placement of palatal releasing incisions at a distance of at least one tooth mesial and distal from the area where the palatal pedicle will be performed is crucial for appropriate visualization. Finally, the clinician must realize that this palatal pedicle flap does need to be rotated 180°. The amount of rotation required is that necessary for placement of this rotated palatal pedicle over the area to be augmented.

The above outlined flap designs ensure attainment and maintenance of passive primary closure in almost all clinical situations.

When faced with extraction of a maxillary second molar, in the presence of a significant palatal hard tissue torus which does not allow rotation of a palatal pedicle flap, a further flap modification may be employed:

A. The initial incision designs are as previously described, with the exception that the distal incision extends into the mucosa distal to the maxillary tuberosity (Fig. 9).

B. Following tooth extraction, and performance of appropriate regenerative therapy, the portion of the buccal flap which overlay the tuberosity distal to the extracted second molar is rotated mesially, so that it overlays the extraction socket area. Such mesial rotation is easily accomplished through the appropriate extension of the distal incisions into the post tuberosity mucosa (Fig. 10).

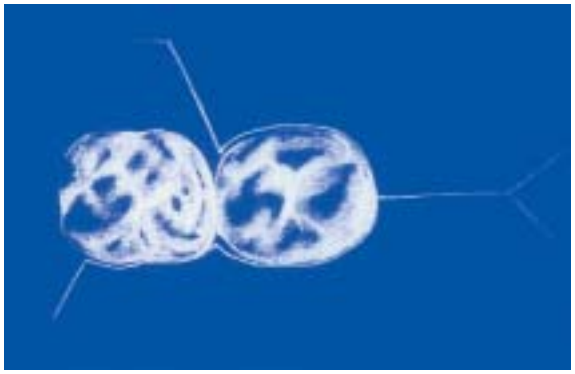
C. A palatal pedicle flap is now rotated from the palatal aspect of the soft tissue which overlaid the maxillary tuberosity. This palatal pedicle now covers the buccal portion of the tuberosity region which has been left denuded through the mesial rotation of the buccal flap (Fig. 11).

D. Appropriate suturing is now carried out.

There are only three reasons not to perform the appropriate regenerative therapy at the time of tooth extraction:

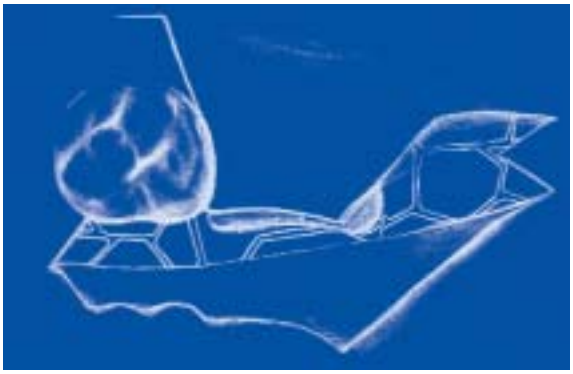
I. The inability to attain and maintain passive soft tissue primary closure: The aforementioned flap designs will ensure the maintenance of such closure. A previous publication documents maintenance of

Fig. 9



Releasing incisions extend into the mucosa distal to the maxillary.

Fig. 10



Following performance of regenerative therapy the buccal flap is rotated mesially from the distal wedge area.

primary closure for a minimum of six months following regenerative therapy in 96.1% of the treated cases. This percentage of success is now much higher, following the development of the additional flap design modification for treatment of maxillary second molar areas.

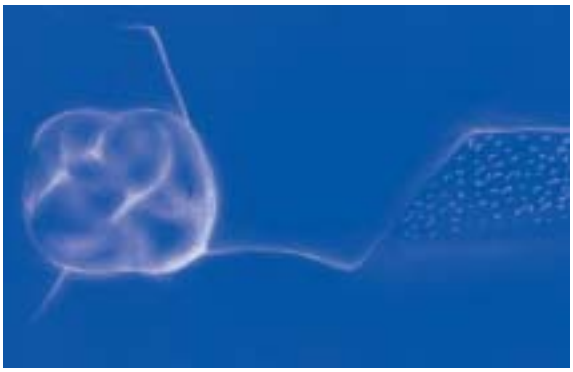
II. The lack of appropriate treatment planning and coordination of therapy between the restorative dentist and the treating periodontist/oral surgeon: Such a lack of coordination is inexcusable.

III. The unwillingness or inability of the periodontist/oral surgeon to see a patient requiring tooth extraction augmentation immediately: This inflexibility on the part of the treating clinician is inexcusable. Our patients deserve better.

Use of GBR therapy at the time of tooth extraction is not a luxury. Such a treatment approach is a necessity, if we are to truly regenerate the hard tissue scaffold of the soft tissue drape of esthetics.

- Paul A. Fugazzotto, DDS

Fig. 11



A pedicle flap is rotated from the internal aspect of the palatal flap in the area of the tuberosity to cover the bone denuded by the mesial rotation of the buccal flap.

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Literature Review

Frederic J. Norkin, DMD

"Clinical and Radiographic Evaluation of the Papilla Level Adjacent to Single-Tooth Dental Implants. A Retrospective Study in the Maxillary Anterior Region"

- *Vincent Choquet, Marc Hermans, Philippe Adriaenssens, Philippe Daelemans, Dennis P. Tarnow, and Chantal Malevez; Journal of Periodontology 2001: 72: 1364-1371.*

One of the greatest challenges facing dentistry is maintenance of interdental papilla in the maxillary anterior region – the esthetic zone. A number of authors including Dennis Tarnow published articles regarding requirements for the maintenance of interdental papillae around natural teeth. In the October 2001 issue of The Journal of Periodontology a study authored by Vincent Choquet et al. reported recent findings on interdental papillae around single tooth dental implants in the maxillary anterior region. The group investigated two specific hypotheses: whether the distance between the contact point and crest of bone correlates with the presence or absence of interproximal papillae adjacent to single-tooth implants; and if second stage surgical technique influences the outcome. The retrospective study evaluated the papilla level around 27 single tooth implants and their adjacent teeth in 26 patients. A total of 52 papillae were evaluated radiographically and clinically. Six months after implant placement, two techniques were used to expose the fixtures: a conventional approach (17 fixtures) and a technique designed to develop papilla around dental implants (10 fixtures).

The study demonstrated several key points. When the distance between the crest of bone and contact point was 5mm or less, papillae was present nearly 100% of the time. However, when the distance between contact point and crestal bone was ≥6mm, papillae were present less than 50% of the time. These findings are similar to those described by Tarnow in 1992 regarding papillae around natural teeth.

There was little clinical and radiographic difference (less than 0.25mm) between the two second stage surgery techniques. Such a discrepancy is not clinically significant.

Achieving anterior esthetics often proves elusive. Tarnow's earlier work provided clinicians with a method of quantifying the distance from crestal bone to contact point required to predictably generate interdental papillae around teeth. Choquet's group provides clinicians with similar information around dental implants. The key to generating and maintaining interdental papillae around dental implants appears to be limiting the distance from the crestal bone to the contact point to 5mm.

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